GE Medical Systems

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GE Medical Systems
LOGIQ™ 9 Service Manual

Operating Documentation

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Important Precautions

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**

WARNING

- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**

AVERTISSEMENT

- **NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.**
- **LE NON-RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.**

- **DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**

WARNUNG

- **VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

AVISO

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS.**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

ATENÇÃO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A‘ CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL’APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL’ADDETTO ALLA MANUTENZIONE, ALL’UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

このサービスマニュアルには英語版しかありません。
ＧＥＭＳ以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。

警告

このサービスマニュアルを熟読し理解せずに、装置のサービスを行わないで下さい。
この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

本维修手册仅存有英文本。
非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。

注意:

未详细阅读和完全了解本手册之前，不得进行维修。
忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

DAMAGE IN TRANSPORTATION

All packages should be closely examined at time of delivery. If damage is apparent write “Damage In Shipment” on ALL copies of the freight or express bill BEFORE delivery is accepted or “signed for” by a GE representative or hospital receiving agent. Whether noted or concealed, damage MUST be reported to the carrier immediately upon discovery, or in any event, within 14 days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this 14 day period.

CERTIFIED ELECTRICAL CONTRACTOR STATEMENT - FOR USA ONLY

All electrical Installations that are preliminary to positioning of the equipment at the site prepared for the equipment shall be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations and testing shall be performed by qualified GE Medical Systems personnel. In performing all electrical work on these products, GE will use its own specially trained field engineers. All of GE’s electrical work on these products will comply with the requirements of the applicable electrical codes.

The purchaser of GE equipment shall only utilize qualified personnel (i.e., GE’s field engineers, personnel of third-party service companies with equivalent training, or licensed electricians) to perform electrical servicing on the equipment.

OMISSIONS & ERRORS

If there are any omissions, errors or suggestions for improving this documentation, please contact the GE Healthcare Global Documentation Group with specific information listing the system type, manual title, part number, revision number, page number and suggestion details. Mail the information to : Service Documentation, 4855 W. Electric Ave (EA-53), Milwaukee, WI 53219, USA.

GE Healthcare employees should use the iTrak System to report all documentation errors or omissions.

Revision History

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0	April 8, 2002	Initial Release
1	November 8, 2002	Update for BT'02 Release, BEP and FEP changes
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Title Page	N/A	Chapter 2 - Pre-Installation pages 2-1 to 2-10	5	Chapter 7 - Diagnostics/ Troubleshooting pages 7-1 to 7-26	5
Important Precautions pages i to iv	5	Chapter 3 - Installation pages 3-1 to 3-22	5	Chapter 8 - Replacement Procedures pages 8-1 to 8-54	5
Rev History/LOEP pages v to vi	5	Chapter 4 - Functional Checks pages 4-1 to 4-22	5	Chapter 9 - Replacement Parts pages 9-1 to 9-58	5
Table of Contents pages vii to xxviii	5	Chapter 5 - Theory pages 5-1 to 5-86	5	Chapter 10 - Periodic Maintenance pages 10-1 to 10-30	5
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Chapter 1 Introduction

Section 1-1 Overview

1-1-1 Purpose of Chapter 1

This chapter describes important issues related to safely servicing the LOGIQ™ 9 scanner. The service provider must read and understand all the information presented in this manual before installing or servicing a unit.

Table 1-1 Contents in Chapter 1

Section	Description	Page Number
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1-3	Safety Considerations	1-7
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1-1-2 Purpose of Service Manual

This Service Manual provides installation and service information for the LOGIQ™ 9 Ultrasound Scanning System and contains the following chapters:

1.) **Chapter 1 - Introduction:** Contains a content summary and warnings.
2.) **Chapter 2 - Pre-Installation:** Contains pre-installation requirements for the LOGIQ™ 9.
3.) **Chapter 3 - Installation:** Contains installation procedures.
4.) **Chapter 4 - Functional Checks:** Contains functional checks that are recommended as part of the installation, or as required during servicing and periodic maintenance.
5.) **Chapter 5 - Components and Functions (Theory):** Contains block diagrams and functional explanations of the electronics.
6.) **Chapter 6 - Service Adjustments:** Contains instructions on how to make available adjustments to the LOGIQ™ 9.
7.) **Chapter 7 - Diagnostics/Troubleshooting:** Provides procedures for running diagnostic or related routines for the LOGIQ™ 9.
8.) **Chapter 8 - Replacement Procedures:** Provides disassembly procedures and reassembly procedures for all changeable Field Replaceable Units (FRU).
9.) **Chapter 9 - Renewal Parts:** Contains a complete list of field replaceable parts for the LOGIQ™ 9.
10.) **Chapter 10 - Care & Maintenance:** Provides periodic maintenance procedures for the LOGIQ™ 9.

1-1-3 Typical Users of the Basic Service Manual

- Service Personnel (installation, maintenance, etc.).
- Hospital's Service Personnel
- Contractors (Some parts of Chapter 2 - Pre-Installation)

1-1-4 LOGIQ™ 9 Models Covered by this Manual

Table 1-2 LOGIQ™ 9 Model Designations

Part Number	Description
2188900	LOGIQ™ 9 120 V Console & Peripherals - BEP1.0
2188900-2	LOGIQ™ 9 240V Console & Peripherals - BEP1.0
2188900-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP1.0
2188900-4	LOGIQ™ 9 120 V Console & Peripherals - BEP2.0
2188900-5	LOGIQ™ 9 240V Console & Peripherals - BEP2.0
2188900-6	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.0
2351100	LOGIQ™ 9 120 V Console & Peripherals - BEP2.1 BT'02
2351100-2	LOGIQ™ 9 240V Console & Peripherals - BEP2.1 BT'02
2351100-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.1 BT'02
2375600	LOGIQ™ 9 120 V Console & Peripherals - BEP2.2 BT'03
2375600-2	LOGIQ™ 9 240V Console & Peripherals - BEP2.2 BT'03
2375600-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.2 BT'03
2404587	LOGIQ™ 9 120 V Console & Peripherals - BEP3 BT'04
2404587-2	LOGIQ™ 9 240V Console & Peripherals - BEP3 BT'04
2404587-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP3 BT'04

1-1-5 Purpose of Operator Manual(s)

The Operator Manual(s) should be fully read and understood before operating the LOGIQ™ 9 and also kept near the unit for quick reference.

Section 1-2
Important Conventions

1-2-1 Conventions Used in Book

Model Designations

This manual covers the LOGIQ™ 9 scanners.

Icons

Pictures, or icons, are used wherever they reinforce the printed message. The icons, labels and conventions used on the product and in the service information are described in this chapter.

Safety Precaution Messages

Various levels of safety precaution messages may be found on the equipment and in the service information. The different levels of concern are identified by a flag word that precedes the precautionary message. Known or potential hazards are labeled in one of following ways:

DANGER **DANGER IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT WILL CAUSE SEVERE PERSONAL INJURY OR DEATH IF THE INSTRUCTIONS ARE IGNORED.**

WARNING ***WARNING IS USED TO INDICATE THE PRESENCE OF A HAZARD THAT CAN CAUSE SEVERE PERSONAL INJURY AND PROPERTY DAMAGE IF INSTRUCTIONS ARE IGNORED.***

CAUTION **Caution is used to indicate the presence of a hazard that will or can cause minor personal injury and property damage if instructions are ignored.**

NOTICE **Equipment Damage Possible**

Notice is used when a hazard is present that can cause property damage but has absolutely no personal injury risk.

Example: Disk drive will crash.

NOTE: Notes provide important information about an item or a procedure. Information contained in a NOTE can often save you time or effort.

1-2-2 Standard Hazard Icons

Important information will always be preceded by the exclamation point contained within a triangle, as seen throughout this chapter. In addition to text, several different graphical icons (symbols) may be used to make you aware of specific types of hazards that could cause harm.

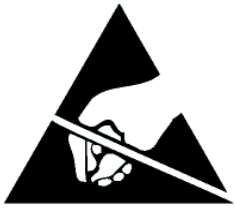


Table 1-3 Standard Hazard Icons

ELECTRICAL	MECHANICAL	RADIATION
		
LASER	**HEAT**	**PINCH**
		

Other hazard icons make you aware of specific procedures that should be followed.

Table 1-4 Standard Icons Indicating a Special Procedure Be Used

AVOID STATIC ELECTRICITY	TAG AND LOCK OUT	WEAR EYE PROTECTION
		

1-2-3 Product Icons

The following table describes the purpose and location of safety labels and other important information provided on the equipment.

Table 1-5 Product Icons

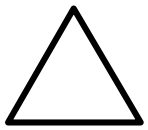
LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
Identification and Rating Plate	Manufacturer's name and address Date of manufacture Model and serial numbers Electrical ratings	Rear of console near power inlet Under monitor On each probe
Device Listing/Certification Labels	Laboratory logo or labels denoting conformance with industry safety standards such as UL or IEC.	Rear of console Under front of monitor
Type/Class Label	Used to indicate the degree of safety or protection.	
IP Code (IPX8)	Indicates the degree of protection provided by the enclosure per IEC 529. IPX8 indicates drip proof.	Footswitch
	Equipment Type BF (man in the box symbol) IEC 878-02-03 indicates B Type equipment having even more electrical isolation than standard Type B equipment because it is intended for intimate patient contact.	Probe connectors PCG connector or Rear of Console
	Equipment Type CF (heart in the box symbol) IEC 878-02-05 indicates equipment having a high degree of protection suitable for direct cardiac contact.	ECG connector Surgical probes
"CAUTION This unit weighs... Special care must be used to avoid..." 	This precaution is intended to prevent injury that may result if one person attempt to move the unit considerable distances or on an incline due to the weight of the unit.	On the console where easily seen during transport
	"CAUTION" The equilateral triangle is usually used in combination with other symbols to advise or warn the user.	Various

Table 1-5 Product Icons (Continued)

LABEL/SYMBOL	PURPOSE/MEANING	LOCATION
	ATTENTION - Consult accompanying documents " is intended to alert the user to refer to the operator manual or other instructions when complete information cannot be provided on the label.	Various
	"CAUTION - Dangerous voltage" (the lightning flash with arrowhead in equilateral triangle) is used to indicate electric shock hazards.	Various
	"Mains OFF" Indicates the power off position of the mains power switch.	Rear of system adjacent to mains switch
	"OFF/Standby" Indicates the power off/ standby position of the power switch. **CAUTION** **This Power Switch DOES NOT ISOLATE Mains Supply**	Adjacent to On-Off Switch
	"Mains ON" Indicates the power on position of the mains power switch. "ON" Indicates the power on position of the power switch. **CAUTION** **This Power Switch DOES NOT ISOLATE Mains Supply**	Front Panel Switch
	"Protective Earth" Indicates the protective earth (grounding) terminal.	Internal
	"Equipotentiality" Indicates the terminal to be used for connecting equipotential conductors when interconnecting (grounding) with other equipment.	Rear of console

Section 1-3
Safety Considerations

1-3-1 Introduction

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates safety standards of design, manufacture and intended use of the equipment.

1-3-2 Human Safety

Operating personnel must not remove the system covers.
Servicing should be performed by authorized personnel only.
Only personnel who have participated in a LOGIQ™ 9 Training are authorized to service the equipment.

1-3-3 Mechanical Safety

WARNING ***Prior to elevating scanner, verify that the floating keyboard is locked in its lowest position. Verify that the front brake is locked and the scanner is unable to swivel. Verify that the rear brakes are in the locked position.***

WARNING ***Use extreme caution when elevating scanner. Elevating scanner will make it unstable which could cause the scanner to tip over.***

WARNING ***Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Use care when handling and protect from damage when not in use. DO NOT use a damaged or defective probe. Failure to follow these precautions can result in serious injury and equipment damage.***

WARNING ***Never use a probe that has fallen to the floor. Even if it looks ok, it may be damaged.***

WARNING ***REMEMBER: If the front caster swivel lock is engaged for transportation, pressing the release pedal once disengages the swivel lock. You must depress the release pedal a second time to engage the brake.***

WARNING ***The system should NOT be moved with the Operator I/O Panel extended. Move the Operator I/O Panel to it's centered and locked position. Lower the Operator I/O Panel as much as possible before moving the system.***

WARNING ***While the software install procedure is designed to preserve data, you should save any patient data, images, system setups to a MOD, CD, DVD or hardcopy before doing a software upgrade.***

CAUTION **Remember to remove the MOD before continuing with the software install.**

CAUTION **The LOGIQ™ 9 weighs 225 kg or more, depending on installed peripherals, (500 lbs., or more) when ready for use. Care must be used when moving it or replacing its parts. Failure to follow the precautions listed could result in injury, uncontrolled motion and costly damage.**



ALWAYS:

Be sure the pathway is clear.

Use slow, careful motions.

Use two people when moving on inclines or lifting more than 11 kg (25 lbs).

CAUTION **Keep the heat venting holes on the monitor unobstructed to avoid overheating of the monitor.**

NOTICE Be careful to not pinch any of the cables.

NOTE: Special care should be taken when transporting the unit in a vehicle:

- *Secure the unit in an upright position.*
- *Lock the wheels (brake)*
- *DO NOT use the Control Panel as an anchor point.*
- *Place the probes in their carrying case.*
- *Eject any Magneto Optical disk, CD or DVD from their drive.*

1-3-4 Electrical Safety

1-3-4-1 Safe Practices

To minimize shock hazard, the equipment chassis must be connected to an electrical ground. The system is equipped with a three-conductor AC power cable. This must be plugged into an approved electrical outlet with safety ground. If an extension cord is used with the system, make sure that the total current rating of the system does not exceed the extension cord rating.

The power outlet used for this equipment should not be shared with other types of equipment.

Both the system power cable and the power connector meet international electrical standards.

WARNING ***CONNECTING A LOGIQ™ 9 SCANNER TO THE WRONG VOLTAGE LEVEL WILL MOST LIKELY DESTROY THE SCANNER.***

1-3-4-2 Probes

Follow these guidelines before connecting a probe to the scanner:

- Inspect the probe prior to each use for damage or degradation to the:
  - Housing
  - Cable strain relief
  - Lens
  - Seal
- Do not use a damaged or defective probe.
- Never immerse the probe connector or adapter into any liquid.

1-3-5 Labels Locations

Refer to the LOGIQ™ 9 Basic User Manual, Chapter 2, for the label locations.

1-3-6 Dangerous Procedure Warnings

Warnings, such as the examples below, precede potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

DANGER **DANGEROUS VOLTAGES, CAPABLE OF CAUSING DEATH, ARE PRESENT IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN HANDLING, TESTING AND ADJUSTING.**



WARNING ***EXPLOSION WARNING***

DO NOT OPERATE THE EQUIPMENT IN AN EXPLOSIVE ATMOSPHERE. OPERATION OF ANY ELECTRICAL EQUIPMENT IN SUCH AN ENVIRONMENT CONSTITUTES A DEFINITE SAFETY HAZARD.

WARNING ***Do Not Substitute Parts or Modify Equipment***

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification of the equipment.

WARNING ***When the top console is in its locked position, the gas shock is compressed and stores mechanical energy. During normal operation the top console, the weight of the monitor and the mechanical force of the gas shock are in balance. Take care if/ when you activate this gas shock. Personal injury can occur after the panel is removed and the shock pressure is released. Take care when you repair the elevation assembly.***

WARNING ***Ensure that the system is turned off and unplugged. To verify that the Front End Power Supply (FEPS) is in a zero energy state, wait at least 20 seconds for the charge on the FEPS capacitors to bleed off before handling the power supply board.***

WARNING ***Use extreme caution as long as LOGIQ™ 9 is un-stable, not resting on all four Casters.***

WARNING ***Tilting the console requires two people in order to avoid injury to service personnel and damage to the equipment.***

WARNING ***Beware of possible sharp edges on all metal chassis parts. If sharp edges are encountered, the appropriate PPE should be used to reduce the risk of injury.***

WARNING ***Do Not attempt to charge batteries other than the type included in the kit (NiMH). Standard alkaline batteries CANNOT be recharged.***

READ all safety precautions that come from the battery and battery charger manufacturers.

CAUTION **These mechanical parts may have sharp edges. If sharp edges are encountered, the appropriate PPE should be used to reduce the risk of injury.**

WARNING ***Risk of electrical shock, system must be turned off and disconnected from power source. Cord must be controlled at all times. Wait at least 20 seconds for the charge on the FEPS capacitors to bleed off before handling the power supply board.***

1-3-7 Battery Safety

To avoid the risk of injury, follow the warning and cautions to make sure that the battery does not burst, ignite, or generate heat of fumes.

CAUTION



The battery pack contains a 24V charge that will cause a spark when it is re-connected to the power supply without power applied to the Back End Processor. Be careful that this spark does not damage any equipment or cause any personal injury.

To avoid the spark, connect the battery with power applied to the BackEnd Processor.

WARNING

- **The battery has a safety device. Do not disassemble or alter the battery.**
- **Charge the batteries only when the ambient temperature is between 0° and 40° C (32° and 104° F).**
- **Do not short-circuit the battery by directly connecting the negative terminals with metal objects.**
- **Do not heat the battery or discard it in a fire.**
- **Do not expose the battery to temperature over 60° C (140° F). Keep it away from fire and other heat sources.**
- **Do not charge the battery near a heat source, such as a fire or heater.**
- **Do not leave the battery in direct sunlight.**
- **Do not drop packs from height to prevent them from possible malfunction damage.**
- **Do not pierce the battery with a sharp object, hit it, or step on it.**
- **Do not use a damaged battery.**
- **Do not solder a battery.**
- **Do not connect the battery to an electrical power outlet.**
- **Do not contact PCM directly to prevent packs from ESD damage.**

CAUTION

To avoid the battery bursting, igniting, or fumes from the battery causing equipment damage, observe the following precautions:

- **Do not immerse the battery in water or allow it to get wet.**
- **Do not put the battery into a microwave oven or pressurized container.**
- **If the battery leaks or emits an odor, remove it from all possible flammable sources.**
- **If the battery emits an odor or heat, is deformed or discolored, or in a way appears abnormal during use, recharging or storage, immediately remove it and stop using it. If you have any questions about the battery, consult GE or your local representative.**
- **Store the battery between -20° C (-4° F) and 60° C (140°F).**
- **Use only GE recognized batteries.**
- **In case of the long term (3 months or more) storage:**
- **Store the battery in a temperature range of 10° C (50° F) and 30° C (86°F).**
- **When charging for the first time after long-term storage. Recover such packs to original performance through repeating several cycles of full charging and discharging.**
- **When store packs for more than 6 months, charge at lease once charging require per 6 months to prevent leakage and deterioration in performance due to self-discharging.**

1-3-8 Lockout/Tagout Requirements (For USA Only)

Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the electrical Mains plug.

NOTICE Energy Control and Power Lockout for LOGIQ™ 9



When servicing parts of the system where there is exposure to voltage greater than 30 Volts:
Unplug the system
Maintain control of the system power plug
There are no test points to verify isolation, you must wait for at least 20 seconds for capacitors to discharge

Beware that the AC Control Box, Front End Processor and Back End Processor may be energized even if the power is turned off when the cord is still plugged into the AC Outlet.

1-3-9 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or an ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

NOTE: The US Department of Transportation (DOT) has ruled that "items that were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purposes and must be transported as a hazardous material.

Section 1-4
Electromagnetic Compatibility (EMC)

1-4-1 What is EMC?

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility results when a susceptible device fails to perform as intended due interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio–frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power of signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

1-4-2 Compliance

The LOGIQ™ 9 unit conforms to all applicable conducted and radiated emission limits and to immunity from electrostatic discharge, radiated and conducted RF fields, magnetic fields and power line transient requirements.

For applicable standards refer to the Safety Chapter in the Basic User Manual.

NOTE: ***For CE Compliance, it is critical that all covers, screws, shielding, gaskets, mesh, clamps, are in good condition, installed tightly without skew or stress. Proper installation following all comments noted in this service manual is required in order to achieve full EMC performance.***

1-4-3 Electrostatic Discharge (ESD) Prevention

⚠ **WARNING** ***Do not touch any boards with integrated circuits prior to taking the necessary ESD precautions:***



1. Always connect yourself, via an arm-wrist strap, to the advised ESD connection point located on the Rear of the scanner (to the right of the power connector).

2. Follow general guidelines for handling of electrostatic sensitive equipment.

⚠ **WARNING** ***Risk of electrical shock, system must be turned off. Avoid all contact with electrical contacts, conductors and components. Always use non-conductive handles designed for the removal and replacement of ESD sensitive parts. All parts that have the potential for storing energy must be discharged or isolated before making contact.***

Section 1-5
Customer Assistance

1-5-1 Contact Information

If this equipment does not work as indicated in this service manual or in the User Manual, or if you require additional assistance, please contact the local distributor or appropriate support resource, as listed below.

Prepare the following information before you call:

- System ID serial number.
- Software version.

Table 1-6 Phone Numbers for Customer Assistance

Location	Phone Number	
USA GE Medical Systems Ultrasound Service Engineering 4855 W. Electric Avenue Milwaukee, WI 53219	Service: On-site Service: Parts Applications Support	1-800–437–1171 1-800-558-2040 1-800-682-5327 or 1-262-524-5698
Canada		1-800-668-0732
Latin America	Service Applications Support	1-262-524-5300 1-262-524-5698
Europe GE Ultraschall Deutschland GmbH& Co. KG BeethovenstraBe 239 Postfach 11 05 60, D-42655 Solingen Germany	Phone: +49 (0)212-2802-207 (General Imaging) +49 (0)212-2802-208 (Cardiac) +43 (0)7682-3800-26 (Kretz Products) Fax: +49 (0)212-2802-431	
Asia (Singapore) GE Ultrasound Asia Service Department - Ultrasound 298 Tiong Bahru Road #15-01/06 Central Plaza Singapore 169730	Tel: +65 291-8528 Fax: +65 272-3997	
Japan Support Center	Phone: 81-426-48-2950 Fax: 81-426-48-2902	

1-5-2 System Manufacturer

Table 1-7 System Manufacturer

Manufacturer	FAX Number
GE Medical Systems - Americas P.O. Box 414 Milwaukee, Wisconsin 53201-0414	414-647-4090

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Chapter 2
Pre-Installation

Section 2-1
Overview

2-1-1 Purpose of Chapter 2

This chapter provides the information required to plan and prepare for the installation of a LOGIQ™ 9. Included are descriptions of the facility and electrical needs to be met by the purchaser of the unit.

Table 2-1 Contents in Chapter 2

Section	Description	Page Number
2-1	Overview	2-1
2-2	General Console Requirements	2-2
2-3	Facility Needs	2-6

Section 2-2
General Console Requirements

2-2-1 Console Environmental Requirements

Table 2-2 Environmental Requirements - LOGIQ™ 9

Operating Temperature	Storage Temperature	Humidity	Heat Dissipation
10° to 30°C	-10° to 60° C	< 90% rH non-condensing	3500 BTU pr hour

*NOTE: Temperature in degrees C. Conversion to Degrees F = (Degrees C * 9/5) + 32).*

2-2-1-1 Cooling

The cooling requirement for the LOGIQ™ 9 is 3500 BTU/hr. This figure does not include cooling needed for lights, people, or other equipment in the room. Each person in the room places an additional 300 BTU/hr. demand on the cooling system.

2-2-1-2 Lighting

Bright light is needed for system installation, updates and repairs. However, operator and patient comfort may be optimized if the room light is subdued and indirect. Therefore a combination lighting system (dim/bright) is recommended. Keep in mind that lighting controls and dimmers can be a source of EMI which could degrade image quality. These controls should be selected to minimize possible interference.

2-2-2 Electrical Requirements

NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system.

Sites with a mains power system with defined Neutral and Live:

The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet.

Sites with a mains power system without a defined Neutral:

The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size ground wire from the distribution panel to the Ultrasound outlet.

NOTE: Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

2-2-2-1 LOGIQ™ 9 Power Requirements

Table 2-3 Electrical Specifications for LOGIQ™ 9

Voltage	Tolerances	Current	Frequency
100-120 VAC	±10%	9.5 A	50-60 Hz
200-240 VAC	±10%	4.75 A	50-60 Hz

2-2-2-2 Inrush Current

Inrush current is not a factor to consider due to the inrush current limiting properties of the power supplies.

2-2-2-3 Site Circuit Breaker

It is recommended that the branch circuit breaker for the machine be readily accessible.

CAUTION **POWER OUTAGE MAY OCCUR.**

The LOGIQ™ 9 requires a dedicated single branch circuit. To avoid circuit overload and possible loss of critical care equipment, make sure you DO NOT have any other equipment operating on the same circuit.

2-2-2-4 Site Power Outlets

A dedicated AC power outlet must be within reach of the unit without extension cords. Other adequate outlets for the external peripherals, medical and test equipment needed to support this unit must also be present within 1 m (3.2 ft.) of the unit. Electrical installation must meet all current local, state, and national electrical codes.

2-2-2-5 Unit Power Plug

If the unit arrives without a power plug, or with the wrong plug, you must contact your GE dealer or the installation engineer must supply what is locally required.

2-2-2-6 Power Stability Requirements

Voltage drop-out

Max 10 ms.

Power Transients

(All applications)
Less than 25% of nominal peak voltage for less than 1 millisecond for any type of transient, including line frequency, synchronous, asynchronous, or aperiodic transients.

2-2-3 EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air or wiring. Ultrasound machines also generate EMI. The LOGIQ™ 9 complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

Electrical and electronic equipment may produce EMI unintentionally as the result of a defect. These sources include:

- medical lasers,
- scanners,
- cauterizing guns,
- computers,
- monitors,
- fans,
- gel warmers,
- microwave ovens,
- light dimmers
- portable phones.

The presence of a broadcast station or broadcast van may also cause interference.

See Table 2-4 for EMI Prevention tips.

Table 2-4 EMI Prevention/Abatement

EMI Rule	Details
Be aware of RF sources	Keep the unit at least 5 meters or 15 feet away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Ground the unit	Poor grounding is the most likely reason a unit will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, RF gaskets, covers, cores	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of card cage. Loose or missing covers or RF gaskets allow radio frequencies to interfere with the ultrasound signals.
Replace broken RF gaskets	If more than 20% or a pair of the fingers on an RF gasket are broken, replace the gasket. Do not turn on the unit until any loose metallic part is removed.
Do not place labels where RF gaskets touch metal	Never place a label where RF gaskets meet the unit. Otherwise, the gap created will permit RF leakage. Or, if a label has been found in such a position, move the label.
Use GE specified harnesses and peripherals	The interconnect cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones	Cellular phones may transmit a 5 V/m signal; that could cause image artifacts.
Properly dress peripheral cables	Do not allow cables to lie across the top of the card cage or hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame.

2-2-4 Scan Probe Environmental Requirements

Table 2-5 Environmental Requirements - Probes

	Operating Temperature	Storage Temperature
Standard Probes	10° to 30°C	-10° to 60° C
4D Probes	18° to 30 ^{o}C	-10° to 50 ^{o}C

*NOTE: Temperature in degrees C. Conversion to Degrees F = (Degrees C * 9/5) + 32).*

NOTICE SYSTEMS AND ELECTRONIC PROBES ARE DESIGNED FOR STORAGE TEMPERATURES OF -20 TO + 50 degrees C. WHEN EXPOSED TO LARGE TEMPERATURE VARIATIONS, THE PRODUCT SHOULD BE KEPT IN ROOM TEMPERATURE FOR 10 HOURS BEFORE USE.

2-2-5 Time and Manpower Requirements

Site preparation takes time. Begin Pre-installation checks as soon as possible. If possible, allow six weeks before delivery, for enough time to make necessary changes.

CAUTION The LOGIQ™ 9 weighs 225 kg or more, depending on installed peripherals, (500 lbs., or more) when ready for use. Care must be used when moving it or replacing its parts. Failure to follow the precautions listed could result in injury, uncontrolled motion and costly damage.



ALWAYS:

Be sure the pathway is clear.

Use slow, careful motions.

Use two people when moving on inclines or lifting more than 11 kg (25 lbs).

Section 2-3
Facility Needs

2-3-1 Purchaser Responsibilities

The work and materials needed to prepare the site is the responsibility of the purchaser. Delay, confusion, and waste of manpower can be avoided by completing pre installation work before delivery. Use the Pre installation checklist to verify that all needed steps have been taken. Purchaser responsibility includes:

- Procuring the materials required.
- Completing the preparations before delivery of the ultrasound system.
- Paying the costs for any alterations and modifications not specifically provided in the sales contract.

NOTE: All electrical installations that are preliminary to the positioning of the equipment at the site prepared for the equipment must be performed by licensed electrical contractors. Other connections between pieces of electrical equipment, calibrations, and testing must also be performed by qualified personnel. The products involved (and the accompanying electrical installations) are highly sophisticated and special engineering competence is required. All electrical work on these products must comply with the requirements of applicable electrical codes. The purchaser of GE equipment must only utilize qualified personnel to perform electrical servicing on the equipment.

The desire to use a non–listed or customer provided product or to place an approved product further from the system than the interface kit allows presents challenges to the installation team. To avoid delays during installation, such variances should be made known to the individuals or group performing the installation at the earliest possible date (preferably prior to the purchase).

The ultrasound suite must be clean prior to delivery of the machine. Carpet is not recommended because it collects dust and creates static. Potential sources of EMI (electromagnetic interference) should also be investigated before delivery. Dirt, static, and EMI can negatively impact system reliability.

2-3-2 Required Features

NOTE: GE Medical Systems requires a dedicated power and ground for the proper operation of its Ultrasound equipment. This dedicated power shall originate at the last distribution panel before the system.

Sites with a mains power system with defined Neutral and Live:

The dedicated line shall consist of one phase, a neutral (not shared with any other circuit), and a full size ground wire from the distribution panel to the Ultrasound outlet.

Sites with a mains power system without a defined Neutral:

The dedicated line shall consist of one phase (two lines), not shared with any other circuit, and a full size ground wire from the distribution panel to the Ultrasound outlet.

NOTE: Please note that image artifacts can occur, if at any time within the facility, the ground from the main facility's incoming power source to the Ultrasound unit is only a conduit.

- Door opening is at least 76 cm (30 in) wide.
- Proposed location for unit is at least 0.3 m (1 ft.) from the wall for cooling
- Power outlet and place for any external peripheral are within 2 m (6.5 ft) of each other with peripheral within 1 m of the unit to connect cables.

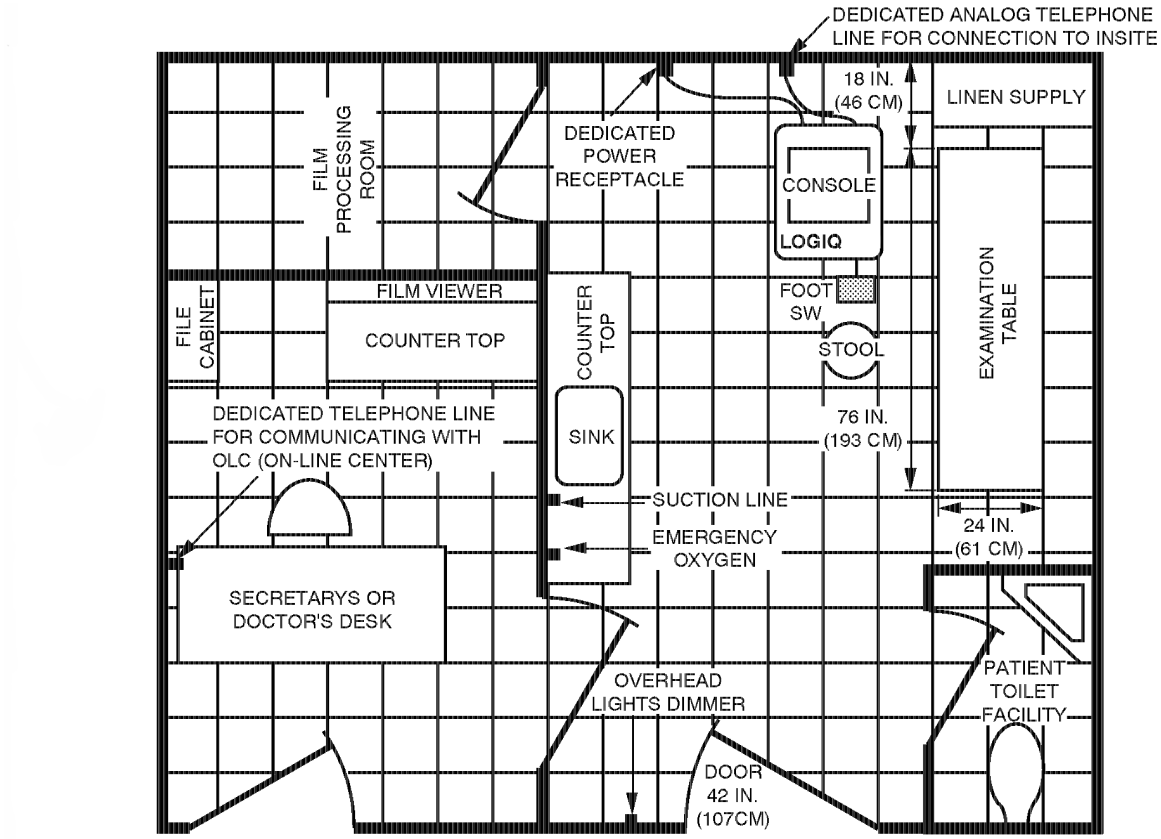
NOTE: The LOGIQ™ 9 has four outlets inside the unit. One is for the monitor and three for on board peripherals.

- Power outlets for other medical equipment and gel warmer
- Power outlets for test equipment and modem within 1 m (3.2 ft) of unit
- Clean and protected space to store transducers (in their cases or on a rack)
- Material to safely clean probes (done with a plastic container, never metal)

2-3-3 Desirable Features

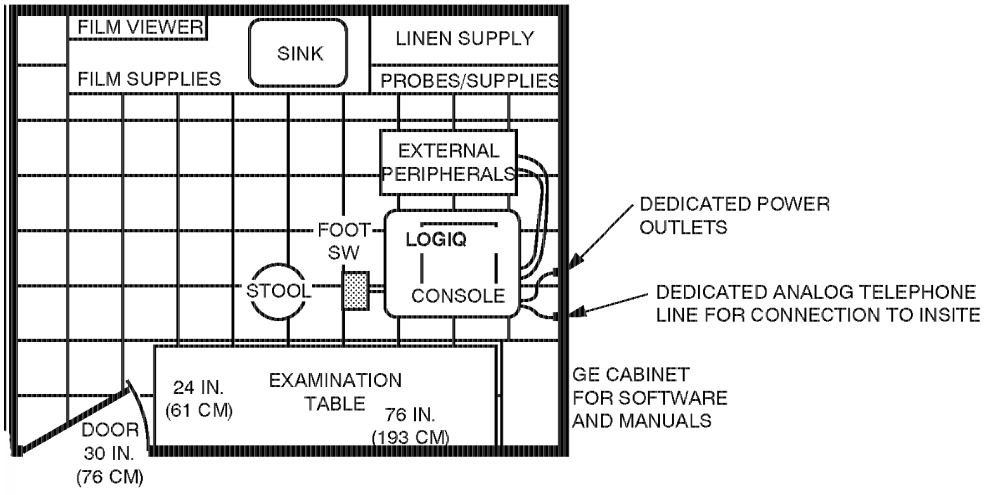
- Door is at least 92 cm (3 ft.) wide
- Circuit breaker for dedicated power outlet is easily accessible
- Sink with hot and cold water
- Receptacle for bio–hazardous waste, like used probe sheaths
- Emergency oxygen supply
- Storage for linens and equipment
- Nearby waiting room, lavatory, and dressing room
- Dual level lighting (bright and dim)
- Lockable cabinet ordered by GE for its software and proprietary manuals

2-3-4 Minimal Floor Plan Suggestion



A 14 by 17 foot Recommended Floor Plan

Scale: Each square equals one square foot



An 8 by 10 foot Minimal Floor Plan

Figure 2-1 Minimal Floor Plan

2-3-5 Networking Pre-installation Requirements

2-3-5-1 Stand Alone Scanner (without Network Connection)

None.

2-3-5-2 Scanner Connected to Hospital's Network

Supported networks: DICOM Network (option)

2-3-5-3 Purpose of the DICOM Network Function

DICOM services provide the operator with clinically useful features for moving images and patient information over a hospital network. Examples of DICOM services include the transfer of images to workstations for viewing or transferring images to remote printers. As an added benefit, transferring images in this manner frees up the on-board monitor and peripherals, enabling viewing to be done while scanning continues. With DICOM, images can be archived, stored, and retrieved faster, easier, and at a lower cost.

2-3-5-4 DICOM Option Pre-installation Requirements

To configure the LOGIQ™ 9 to work with other network connections, the site's network administrator must provide some necessary information.

Information must include:

- A host name, local port number, AE Title, IP address and Net Mask for the LOGIQ™ 9.
- The IP addresses for the default gateway and other routers at the site for ROUTING INFORMATION.
- The host name, IP address, port and AE Title for each device the site wants connected to the LOGIQ™ 9 for DICOM APPLICATION INFORMATION. A field for the make (manufacturer) and the revision of the device, is also included. This information may be useful for solving errors.

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Chapter 3 Installation

Section 3-1 Overview

3-1-1 The Purpose of Chapter 3

This chapter contains information needed to install the unit. Included are procedures to receive, unpack and configure the equipment.

Table 3-1 Contents in Chapter 3

Section	Description	Page Number
3-1	Overview	3-1
3-2	Installation Reminders	3-1
3-3	Receiving and Unpacking the Equipment	3-4
3-4	Preparing for Installation	3-5
3-5	Completing the Installation	3-6
3-6	System Configuration	3-9
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3-8	Software/Option Configuration	3-18
3-9	Connectivity Installation Worksheet	3-19
3-10	Before Starting a Software Upgrade	3-20
3-11	Loading Base Image Software	3-20
3-12	Loading Application Software	3-20
3-13	System Setup	3-20
3-14	Connecting USB Line Printer - HP970/990 and HP6122	3-21
3-15	Paperwork	3-22

Section 3-2 Installation Reminders

3-2-1 Average Installation Time

Table 3-2 Average Installation Time

Description	Average Installation Time	Comments
Unpacking the scanner	0.5 hours	

Table 3-2 Average Installation Time

Description	Average Installation Time	Comments
Scanner wo/options	0.5 hours	Dependant on the required configuration
DICOM Option	0.5 - 2.0 hours	Dependant on the configuration amount

3-2-2 Installation Warnings

1.) Since the LOGIQ™ 9 weighs approximately 225 kg (500 lb.) without options, two people are required to unpack it. Two people are also required for installing any additional items in excess of 11 kg (25 lbs).

2.) There are no operator serviceable components. To prevent shock, do not remove any covers or panels. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing and troubleshooting.

3.) After being transported, the unit may be very cold or hot. If this is the case, allow the unit to acclimate before you turn it on. It requires one hour for each 2.5°C increment it's temperature is below 10°C or above 40°C.

⚠ **CAUTION Equipment damage possibility. Turning the system on without acclimation after arriving at site may cause the system to be damaged.**

Table 3-3 Acclimation Time

°C	60	55	50	45	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40
°F	140	131	122	113	104	96	86	77	68	59	50	41	32	23	14	5	-4	-13	-22	-31	-40
hrs	8	6	4	2	0	0	0	0	0	0	0	2	4	6	8	10	12	14	16	18	20

3-2-2-1 Brake Pedal Operation

⚠ **WARNING** ***REMEMBER: If the front caster swivel lock is engaged for transportation, pressing the release pedal once disengages the swivel lock. You must depress the release pedal a second time to engage the brake.***

3-2-2-2 Operator I/O Panel Position

If weight is placed on the Operator I/O Panel in it's extended position the console could tip over.

⚠ **WARNING** ***The system should NOT be moved with the Operator I/O Panel extended. Move the Operator I/O Panel to it's centered and locked position. Lower the Operator I/O Panel as much as possible before moving the system.***

3-2-3 Safety Reminders

DANGER **WHEN USING ANY TEST INSTRUMENT THAT IS CAPABLE OF OPENING THE AC GROUND LINE (I.E., METER'S GROUND SWITCH IS OPEN), DON'T TOUCH THE UNIT!**

CAUTION **Two people should unpack the unit because of its weight. Two people are required whenever a part weighing 11 kg (25 lbs) or more must be lifted.**

CAUTION **If the unit is very cold or hot, do not turn on its power until it has had a chance to acclimate to its operating environment.**

CAUTION **To prevent electrical shock, connect the unit to a properly grounded power outlet. Do not use a three to two prong adapter. This defeats safety grounding.**

CAUTION **Do NOT wear the ESD wrist strap when you work on live circuits and more than 30 V peak is present.**

CAUTION **Do not use a 20 Amp to 15 Amp adapter on the 120 Vac unit's power cord. This unit requires a dedicated 20 A circuit and can have a 15A plug if the on board peripherals do not cause the unit to draw more than 14.0 amps.**

CAUTION **Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.**

CAUTION **OPERATOR MANUAL(S)**
The User Manual(s) should be fully read and understood before operating the LOGIQ™ 9 and kept near the unit for quick reference.

CAUTION **ACOUSTIC OUTPUT HAZARD**
Although the ultrasound energy transmitted from the LOGIQ™ 9 probe is within FDA limits, avoid unnecessary exposure. Ultrasound energy can produce heat and mechanical damage.



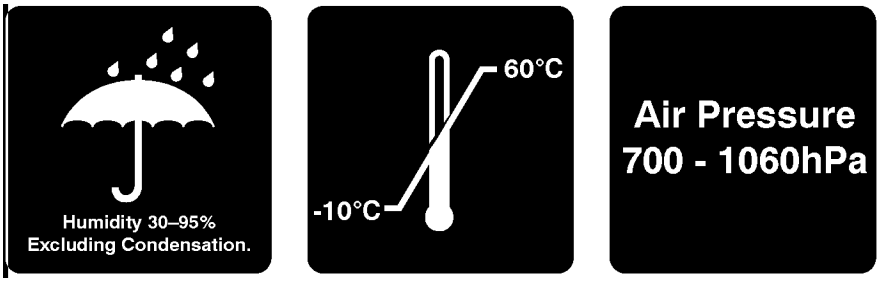


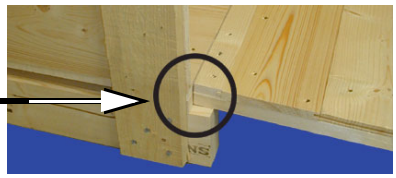
Figure 3-1 Environmental Labels

Section 3-3
Receiving and Unpacking the Equipment



CAUTION **Have two people available to unpack the LOGIQ™ 9. Attempts to move the unit considerable distances or on an incline by one person could result in injury or damage or both.**

Table 3-4 Unpacking Procedure

Step	Task
1.	Open the four hinges on each door 
2.	Remove the doors at both ends of the box
3.	Place the front door against the rear edge of the pallet. The front door can be used as a ramp.  **Be sure to place the ramp (front door) as illustrated here.** 
4.	Carefully remove the accessory box, and any other items, including the wooden shelf above the scanner's keyboard and all the filling material, from the wooden box.
5.	Press once on the swivel lock to release the brake.  **Swivel Lock**
Caution: Two people are needed in the next step due to the weight of the equipment.	
6.	Carefully move the scanner out of the wooden box, down the ramp.
7.	Remove the clear plastic (wrapped around the scanner) from the unit.

Section 3-4
Preparing for Installation

3-4-1 Verify Customer Order

Compare items received by the customer to that which is listed on the delivery order. Report any items that are missing, back ordered or damaged.

3-4-2 Physical Inspection

3-4-2-1 System Voltage Settings

Verify that the scanner is set to the correct voltage.
The Voltage settings for the LOGIQ™ 9 Scanner is found on a label to the right of the Power switch and External I/O, on the rear of the system.


GE Ultrasound
LOGIQ 9
CAUTION - United States law restricts this device to sale or use by or on the order of a physician.
200 kg
GENERAL ELECTRIC COMPANY
MILWAUKEE, WISCONSIN MADE IN U.S.A
MODEL 2188900
S/N 54976US6
MANUFACTURED OCTOBER 2002
DESC LOGIQ 9
100-120V~
50/60Hz 12 A
CISPR 11 / EN 55011
CLASS: A GROUP:1
CLASSE: A GROUPE1
CE 0459
GE Ultrasound
LOGIQ 9
CAUTION - United States law restricts this device to sale or use by or on the order of a physician.
200 kg
CONFORMS TO UL STD 2601-1
CERTIFIED TO CAN/CSA STD C22.2 NO. 601.1
CISPR 11 / EN 55011
CLASS: A GROUP:1
CLASSE: A GROUPE1
CE 0459

Figure 3-2 Rating Plate Examples

⚠ **WARNING** ***CONNECTING A LOGIQ™ 9 SCANNER TO THE WRONG VOLTAGE LEVEL WILL MOST LIKELY DESTROY THE SCANNER.***

3-4-2-2 Video Formats

Check that the video format is set to the locally used video standard, NTSC or PAL.

3-4-3 EMI Protection

This unit has been designed to minimize the effects of Electo-Magnetic Interference (EMI). Many of the covers, shields, and screws are provided primarily to protect the system from image artifacts caused by this interference. For this reason, it is imperative that all covers and hardware are installed and secured before the unit is put into operation.

Section 3-5
Completing the Installation

3-5-1 Power On / Boot Up

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

3-5-1-1 Scanner Power On

1.) Connect the Power Cable to the back of the system.
2.) Ensure the Cable Clip slips securely over the shoulders on the molded plug.
3.) Connect the Main Power Cable to a hospital grade power receptacle with the proper rated voltage. Never use an adapter that would defeat the safety ground.
4.) Switch ON the Circuit Breaker at the rear of the system.



Figure 3-3 Circuit Breaker and Power Cable on Back of Scanner

When power is applied to the scanner and the rear Circuit Breaker is turned ON, power is distributed to the Cooling Unit, Control Panel, Monitor, Internal and External I/O Boards, Peripherals and the Back-end Processor.

⚠ **NOTICE** When AC power is applied to the scanner, the On / Off switch (which is also used to get into and out off standby mode) on the Control panel illuminates amber, indicating the Back End Processor is in standby mode.

3-5-1-2 Back-end Processor Boot Up

Press the **On / Off** switch on the Control Panel once.

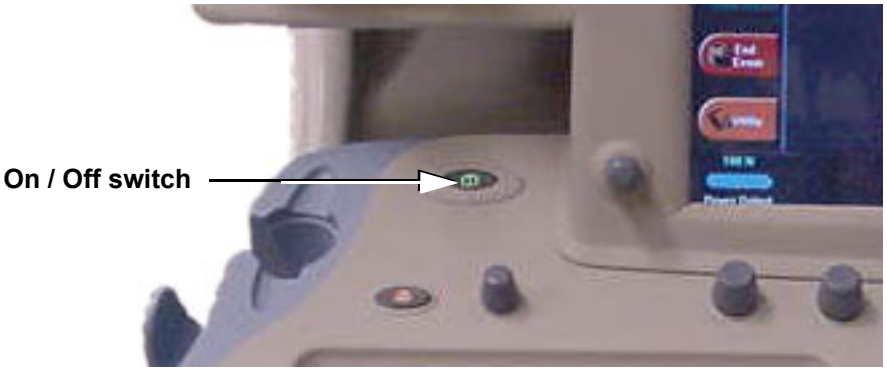


Figure 3-4 On / Off switch for Back-end Processor Boot Up

When the **On / Off switch** (which is also used to get into and out off standby mode) on the Control Panel is pressed once, the Back-end Processor starts and the software code is distributed to initiate the scanner.

No status messages are displayed during this process.

3-5-2 Power Off/ Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

3-5-2-1 Back-end Processor Power Down

1.) Press the **On / Off switch** on the Control Panel once to display the SYSTEM - EXIT menu.
2.) Select Shutdown from the SYSTEM - EXIT menu.

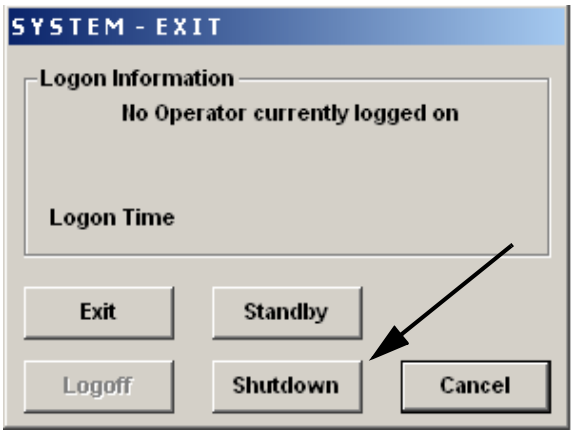


Figure 3-5 System Exit Menu

3-5-2-2 Scanner Shutdown



Figure 3-6 Circuit Breaker and Power Cable on Back of Scanner

1.) Switch OFF the Circuit Breaker at the back of the system.

2.) Disconnect the Mains Power Cable is necessary. *For example:* Relocating the scanner.

NOTICE Disconnecting the Mains Power Cable *before* switching OFF the Circuit Breaker will activate the uninterruptible power system (UPS) in the backend processor, forcing an ordered shutdown of the system.

NOTICE The UPS serves *only* as a battery backup that allows for a soft shut-down of the scanner to prevent file corruption. **IT DOES NOT REGULATE INCOMING VOLTAGE**.

3-5-3 Transducer Connection

1.) Connect a transducer to one of the three rightmost transducer receptacle as follows:

A.) Ensure that the transducer twist lock lever is in the horizontal position.

B.) Insert the transducer connector on the receptacle guide pin until it touches the receptacle mating surface.

C.) Twist the transducer twist lock lever to vertical position to lock it in place. Twist the lever to the horizontal position to disconnect the transducer.

NOTE: It is not necessary to turn OFF power to connect or disconnect a transducer.

Section 3-6
System Configuration

3-6-1 System Specifications

3-6-1-1 Physical Dimensions

The physical dimensions of the LOGIQ™ 9 unit are summarized in Table 3-1 and Table 3-2.

Table 3-1 lists the size of LOGIQ™ 9, with monitor and on-board peripherals.

Table 3-1 Physical Dimensions of LOGIQ™ 9

Height		Width	Depth
Minimum	Maximum		
140.3 cm / 55.25 inches	160.7 cm / 63.25 inches	64 cm / 25.2 inches	89.9 cm / 35.4 inches

3-6-1-2 Weight without Monitor and Peripherals

Table 3-2 Weight of LOGIQ™ 9 With Monitor and Without Other Peripherals

Model	Weight [kg]	Weight [lbs.]
LOGIQ™ 9	200	434

3-6-1-3 Acoustic Noise Output:

Less than 70dB(A) according to DIN 45635 - 19 - 01 - KL2.

3-6-2 Electrical Specifications

Table 3-3 Electrical Specifications for LOGIQ™ 9

Voltage	Tolerances	Current	Frequency
100-120 VAC	±10%	9.5 A	50-60 Hz
200-240 VAC	±10%	4.75 A	50-60 Hz

3-6-3 On-Board Optional Peripherals

Table 3-4 Approved On-Board Peripherals

Device	Manufacturer	Model	Video Signal
B/W Video Printer	SONY	UP-895MDW	NTSC/PAL
Video Cassette Recorder	SONY	SVO-9500MD SVO-9500-MDP	NTSC PAL
Color Video Printer	SONY	UP-51MD UP-D21 UP-D23MD	

3-6-4 External I/O Connector Panel (Back of system)

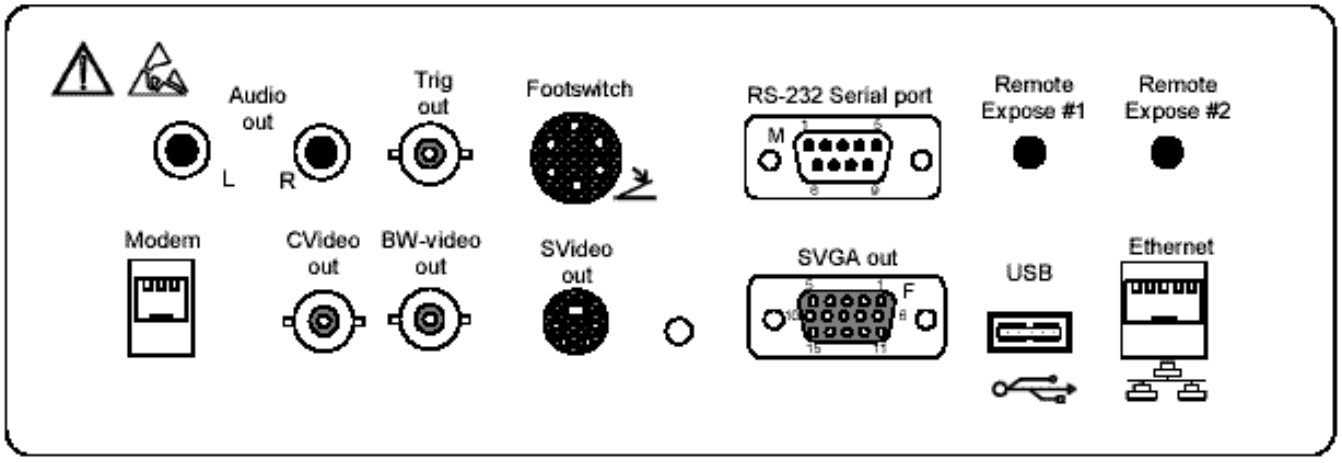


Figure 3-7 External I/O Panel Labels (Prior to BT03)

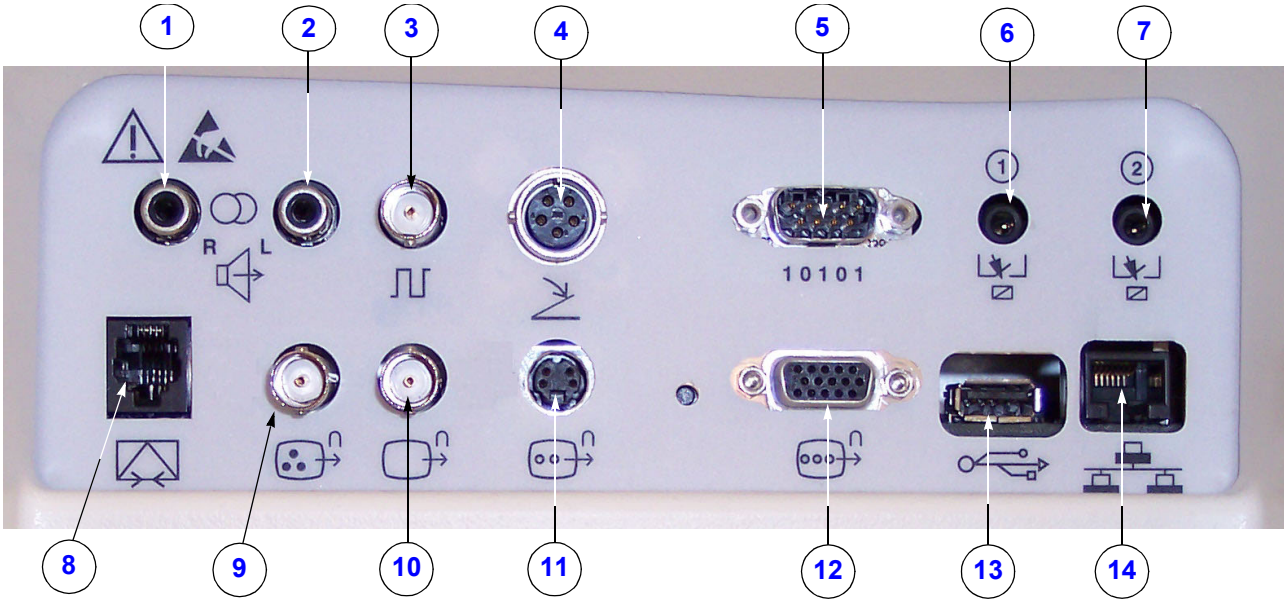


Figure 3-8 External I/O Panel Connectors

3-6-4 External I/O Connector Panel (Back of system) (cont'd)

Table 3-5 External I/O Connector Descriptions

Item	Connector Name	Table Number	Description		
1	Audio Output (Left)		RCA Phono Jack		
2	Audio Output (Right)		RCA Phono Jack		
3	Trigger Output		BNC Connector		
4	Footswitch	Table 3-6	Hirose Electric Co. RM12BRB-5S, Footswich transport shelf is in the back at the bottom		
5	RS232 Com1		DSUB 9 pin male		
6	Expose 1	Table 3-7	Mini-phone Jack		
7	Expose 2	Table 3-7	Mini-phone Jack		
8	Modem Connection	Table 3-8	RJ-11 with global adapter kit for connection		
9	Composite Video Out		BNC Connector, Color Output		
10	B/W Video Out		BNC Connector, Black and White Output		
11	S-Video Output	Table 3-9	4 pin mini-DIN		
12	S-VGA Output	Table 3-10	DSUB-HD22 15 Pin female		
13	USB (1)	Table 3-11			
14	Ethernet Connection	Table 3-12	RJ-45 Connector		

3-6-4-1 External I/O Pin Outs

Table 3-6 Footswitch Connector

Pin No	Output Signal	Description
1	Foot 1	
2	Floating Ground	
3	Foot 2	
4	Floating Ground	
5	Foot 3	

Table 3-7 Remote Expose 1 & 2 Connectors

Pin No	Output Signal	Description
1	SHUTTER/PRINT	
2	Signal GND	

Table 3-8 Modem, RJ11 Modular 6 Pin

Pin No	Output Signal	Description
2	TEL L4	Telephone L4
3	TEL L2	Telephone L2
4	TEL L1	Telephone L1
5	TEL L3	Telephone L3
Others	NC	Non-connection

Table 3-9 S-Video Connector, 4 Pin

Pin No	Output Signal	Description
1	SVIDEO OUT/IN YG	Y (Luma) GND
2	SVIDEO OUT/IN CG	C (Chroma) GND
3	SVIDEO OUT/IN Y	Y (Luma) SIGNAL
4	SVIDEO OUT/IN C	C (Chroma) SIGNAL

3-6-4-1 External I/O Pin Outs (cont'd)

Table 3-10 S-VGA Connector, Shrinked Sub-D 15 Pin

Pin No	Output Signal	Description
1	VGA OUT1 R	Red
2	VGA OUT1 G	Green
3	VGA OUT1 B	Blue
4, 9,11,12,15	N/C	N/C
5, 6, 7, 8, 10	GND	GND
13	VGA OUT1 HS	H Sync
14	VGA OUT1 VS	V Sync

Table 3-11 USB (A) Connector

Pin No	Output Signal	Description
1	VCC	USB Power Supply
2	- Data	USB Data (-)
3	+ Data	USB Data (+)
4	GND	USB Power Ground

Table 3-12 Ethernet Connector, RJ45 Modular 8 Pin

Pin No	Output Signal	Description
1	ETHER TD	Ethernet RD+
2	ETHER TD	Ethernet RD-
3	ETHER RD	Ethernet TD+
6	ETHER RD	Ethernet TD-
Others	NC	Non-connection

3-6-5 Other I/O Ports (Front of system)

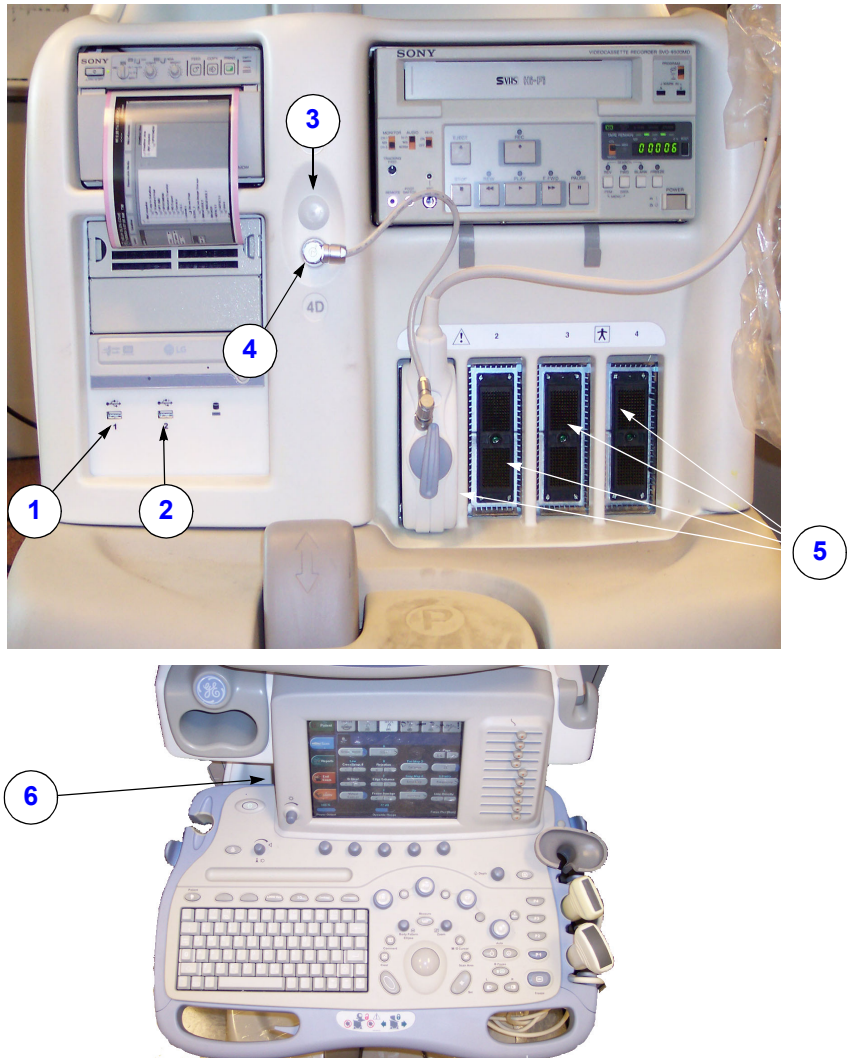


Figure 3-9 Front Connectors

Table 3-13 Front I/O Connector Descriptions

Item	Connector Name	Description
1	USB	On BEP3 Only
2	USB	On BEP 3 Only
3	CW	CW probe connection port (optional)
4	4D	4D Probe connection port (optional)
5	Probe Connectors	The two left most connectors are recommended for 4D Probe placement
6	USB	On upper console for wired voice connection Only

Table 3-14 CW Connector, J1 (Optional)

Pin No	Output Signal	Description
2	DOPIN	COAX CENTER, RED JACKET
3	DOPIN GND	COAX SHIELD, RED JACKET
5	ID0	R1-2
6	PCW	COAX CENTER, WHT JACKET
7	PCW GND	COAX SHIELD, WHT JACKET
8	ID1	R1-1
10		OUTER SHIELD
Shell		OUTER SHIELD

Table 3-15 4D Connector (Optional)

Pin No	Signal	Description
4	GND	
8	SIN_DRV	
7	SIN_RTN	
2	ACTIVE	
5	COS_RTN	
6	COS_DRV	
3	HALL1	

Table 3-16 Flock of Birds, Small Connector (Optional, not shown in Figure 3-9)

Pin No	Signal	Description
1	EEC	
2	EXC_RTN	
3	Rx_Y	
4	Rx_X	
5	Rx_RTN	
6	Rx_Z	
7	EXC	
8	EED	

Table 3-17 Flock of Birds, Large Connector (Optional, not shown in Figure 3-9)

Pin No	Signal	Description
1	TYRTNO	
2	EECO_TX	
3	EED_TX	
4	PWM_EMI	
5	TXRTN0	
6	TZRTN0	
7	VCC_	
8	GND	
Center	TYRTNO	

3-6-6 Video Specification

Video specifications may be needed to be able to connect laser cameras or other devices to the LOGIQ™ 9.

NOTE: 800x600 75hz is the only output available for external video connectors

Table 3-18 Video Specifications

Timing Parameter	1024x768 75Hz	768x576 50Hz	640x480 60Hz	800x600 60Hz	800x600 75Hz	1024x768 60Hz
Horizontal Rate [kHz]	60.02	31.25	31.47	37.88	46.88	48.36
Horizontal Period [µs]	16.66	32.00	31.78	26.40	21.33	20.68
Pixel Clock [MHz]	78.75	29.50	24.55	40.00	49.50	65.00
H Blank Width [µs]	3.66	5.97	5.70	6.40	5.17	4.92
H Sync Width [µs]	1.22	2.34	2.36	3.20	1.62	2.09
H Front Porch [µs]	0.20	0.75	0.73	1.00	0.32	0.37
Active Horizontal Period [µs]	13.00	26.03	26.07	20.00	16.16	15.75
Vertical Rate [Hz]	75.03	50.00	59.94	60.32	75.00	60.00
Vertical Period [ms]	13.33	20.00	16.68	16.58	13.33	16.67
V Sync Width [lines=ms]	32=0.53	49=1.57	45=1.43	28=0.74	25=0.53	38=0.79
V Front Porch [lines=µs]	3=50.00	5=160.00	6=190.70	4=105.60	3=64.00	6=124.10
Equalization Gate [lines=µs]	1=16.66	5=160.0	6=190.7	1=26.4	1=21.3	3=62.00
Lines: Field/Frame	800	625/625	525/525	628	625	806
Active Lines/Frame	768	576	480	600	600	768

Section 3-7
Available Probes

See Specifications in the LOGIQ™ 9 User Reference Manual for probes and intended use.

See "Renewal Parts" on page 9-1, for part numbers to be used when ordering new or replacement probes.

Section 3-8
Software/Option Configuration

Refer to the LOGIQ™ 9 Basic User Manual, Chapter 16, Customizing Your System for information on configuring items like Hospital, Department, Language, Units (of measure), Date, Time and Date Format.

For information on configuring Software Options, Refer to the LOGIQ™ 9 Basic User Manual, Chapter 16, Customizing Your System.

For information on configuring DICOM Connectivity, Refer to the LOGIQ™ 9 Basic User Manual, Chapter 16, Customizing Your System.

Section 3-9
Connectivity Installation Worksheet

Site System Information

Site:

Dept:

LOGIQ SN: Type:

Floor:

Room:

REV:

Comments:

CONTACT INFORMATION

Name	Title	Phone	E-Mail Address

TCP/IP Settings

Name - AE Title:

IP Settings

IP Address:

Subnet Mask:

Default Gateway:

Remote Archive Setup

Remote Archive IP:

Remote Archive Name:

Services (Destination Devices)

	Device Type	Manufacturer	Name	IP Address	Port	AE Title
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

Section 3-10
Before Starting a Software Upgrade

This information has been moved - See Section 8-5 on page 8-9

Section 3-11
Loading Base Image Software

This information has been moved - See Section 8-7 on page 8-17

Section 3-12
Loading Application Software

This information has been moved - See Section 8-8 on page 8-24

Section 3-13
System Setup

This section has been moved - See Section 8-10 on page 8-31

Section 3-14
Connecting USB Line Printer - HP970/990 and HP6122

Beginning with Application Software R4.0.0

1.) Attach the USB cable from the printer to the USB port on the back of the ultrasound system. The New Hardware detected pop-up will be displayed briefly.

2.) If you're attaching a HP Deskjet 990Cxi or 970Cxi printer or HP Deskjet 6122, the system should immediately recognize the newly attached printer and automatically install and configure the printer for you without any additional user intervention.

On Systems Running Software prior to R4.0.0 follow the steps in 3-14-1 on page 3-21 .

3-14-1 Printer Installation Before Application Software Installation (R2.X or R3.X)

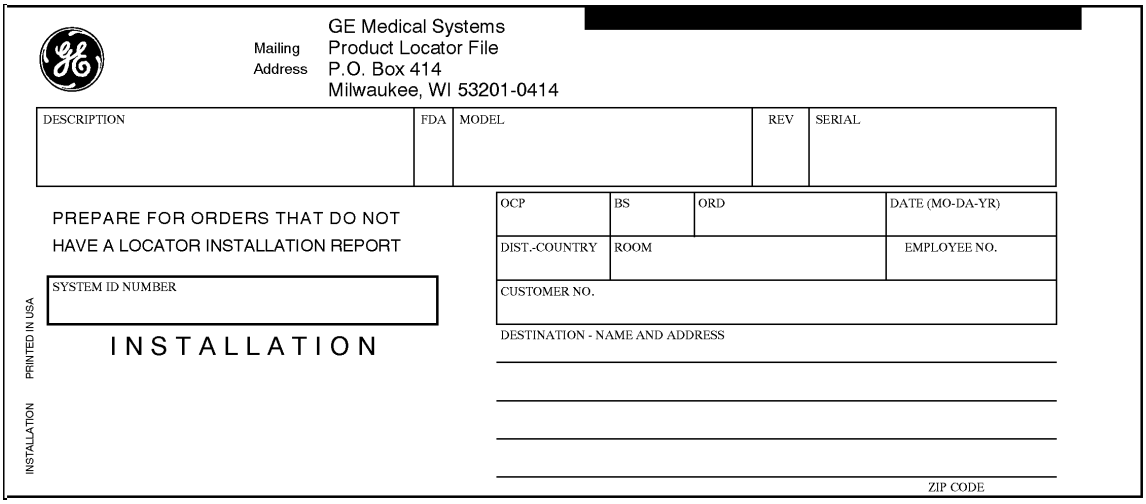
1.) Install the printer after installing base image software, but before application software has been installed. Plug in the printer USB cable and the system will recognize the device. Continue with the Application Software load.

Section 3-15
Paperwork

NOTE: During and after installation, the documentation (i.e. User Manuals, Installation Manuals...) for the peripheral units must be kept as part of the original system documentation. This will ensure that all relevant safety and user information is available during the operation and service of the complete system.

3-15-1 Product Locator Installation

NOTE: The Product Locator Installation Card shown may not be same as the provided Product Locator card.


GE Medical Systems
Mailing Address
Product Locator File
P.O. Box 414
Milwaukee, WI 53201-0414

DESCRIPTION	FDA	MODEL	REV	SERIAL

PREPARE FOR ORDERS THAT DO NOT HAVE A LOCATOR INSTALLATION REPORT

SYSTEM ID NUMBER

INSTALLATION

OCP	BS	ORD	DATE (MO-DA-YR)
DIST.-COUNTRY	ROOM		EMPLOYEE NO.
CUSTOMER NO.			

DESTINATION - NAME AND ADDRESS

ZIP CODE

PRINTED IN USA

INSTALLATION

Figure 3-10 Product Locator Installation Card

3-15-2 User Manual(s)

Check that the correct User Manual(s) for the system and software revision, is included with the installation. Specific language versions of the User Manual may also be available. Check with your GE Sales Representative for availability.

Chapter 4
Functional Checks

Section 4-1
Overview

4-1-1 Purpose of Chapter 4

This chapter provides procedures for quickly checking major functions of the LOGIQ™ 9 scanner diagnostics by using the built-in service software, and power supply adjustments.

Table 4-1 Chapter 4 Contents

Section	Description	Page Number
4-1	Overview	4-1
4-2	General Procedure	4-2
4-3	Software Configuration Checks	4-18
4-4	Peripheral Checks	4-19
4-5	Mechanical Function Checks	4-20
4-6	Site Log	4-22

⚠ **NOTICE** **Most of the information pertaining to this *Functional Checks* chapter is found in the *LOGIQ™ 9 Quick Guide* (Direction number 2309820-100).**

NOTE: Additional information on LOGIQ™ 9 Functional Checks can be found in the following Quick Guides:

Table 4-2 Quick Guide Direction Numbers

Application Software Version	Direction Number
R2.X	2309820-100
R3.X	2384458-100
R4.X	5113779-100

4-1-2 Required Equipment

- An empty (blank) MO Disk (If system has a Magneto-Optical Drive) or blank CD-R or DVD-R.
- At least one transducer. See “Probes” on page 1-56. for an overview.
  (normally you should check all the transducers used on the system)

Section 4-2
General Procedure

CAUTION **SYSTEM REQUIRES ALL COVERS**
Operate this unit only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes.

NOTICE Energy Control and Power Lockout for LOGIQ™ 9



When servicing parts of the system where there is exposure to voltage greater than 30 Volts:
Unplug the system
Maintain control of the system power plug
There are no test points to verify isolation, you must wait for at least 20 seconds for capacitors to discharge
Beware that the AC Control Box, Front End Processor and Back End Processor may be energized even if the power is turned off when the cord is still plugged into the AC Outlet.

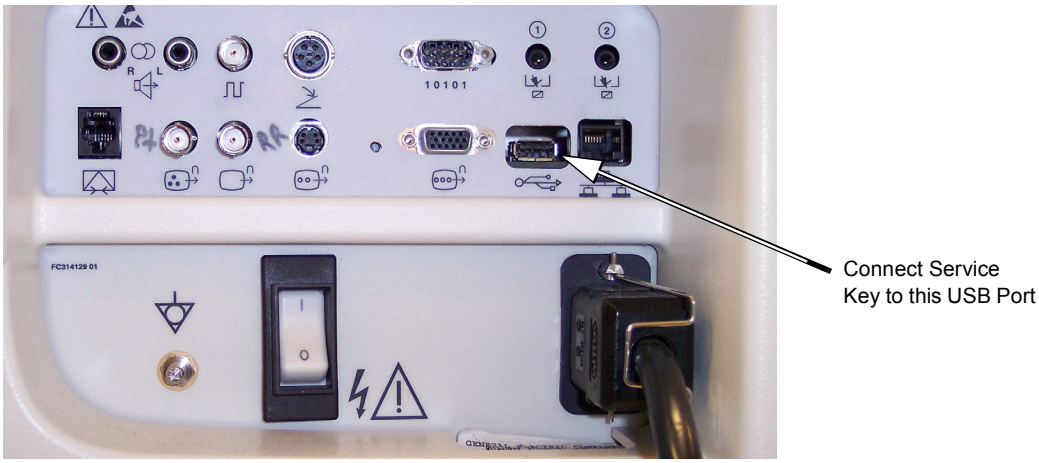


Figure 4-1 USB Port for Service Key on Back of Scanner

4-2-1 Power On / Boot Up

4-2-1-1 Connect Mains Power to the scanner

DANGER **ALWAYS CONNECT THE UNIT TO A FIXED POWER SOCKET WHICH HAS THE PROTECTIVE GROUNDING CONNECTOR.**

DANGER **NEVER USE A THREE-TO-TWO PRONG ADAPTER; THIS DEFEATS THE SAFETY GROUND.**

DANGER **ENSURE THAT THE POWER CORD AND PLUG ARE INTACT AND THAT THE POWER PLUG IS THE PROPER HOSPITAL-GRADE TYPE (WHERE REQUIRED).**

CAUTION **SYSTEM REQUIRES ALL COVERS**
OPERATE THIS UNIT ONLY WHEN ALL BOARD COVERS AND FRAME PANELS ARE SECURELY IN PLACE. THE COVERS ARE REQUIRED FOR SAFE OPERATION, GOOD SYSTEM PERFORMANCE AND COOLING PURPOSES.

NOTICE Use only power supply cords, cables and plugs provided by or designated by GE Medical Systems.

NOTE: Do not cycle the Circuit Breaker ON-OFF-ON in less than five -5- seconds. When turning OFF the Circuit Breaker, the system should de-energize completely before turning the circuit breaker ON.

NOTE: When turning on a system from standby mode, it takes a few seconds before it responds. Do not push the On/off button again during this period. A second push will initiate a full shutdown.

NOTE: If the unit has been unplugged or main breaker in the OFF state for more than3 to 5 days, the unit may not boot, or may beep when turned on.

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

NOTE: On BEP3s there is a blinking stand-by indicator. When the ON/OFF switch blinks between Green and White the system is in STANDBY.

Follow these steps to connect Mains Power to the scanner:

Connecting the LOGIQ™ 9 scanner involves preliminary checks of the power cord, voltage level and compliance with electrical safety requirements.

1.) Ensure that the wall outlet is of appropriate type, and that the power switch is turned off.
2.) Verify that the on-site mains voltage is within the limits indicated on the rating label near the Circuit Breaker on the rear of the unit.
3.) Verify the Circuit Breaker at the rear of the scanner is OFF.
4.) Verify that the power cable is without any visible scratches or any sign of damage.
5.) Connect the Power Cable to the back of the system.
6.) Ensure the Cable Clip slips securely over the shoulders on the molded plug.
7.) Connect the Power Cable to an appropriate mains power outlet, allowing sufficient slack so that the unit can be moved slightly.
8.) Switch ON the Circuit Breaker at the rear of the system.



Figure 4-2 Circuit Breaker and Power Cable on Back of Scanner

When power is applied to the scanner and the rear Circuit Breaker is turned ON, power is distributed to the Cooling Unit, Control Panel, Monitor, Internal and External I/O Boards, Peripherals, the Back-end Processor and the Frond End Power Supply.

NOTICE When AC power is applied to the scanner, the ON/OFF switch on the Control panel illuminates amber, indicating the system is in System Ready Mode.

NOTE: If the unit has been unplugged or main breaker in the OFF state for more than3 to 5 days, the unit may not boot, or may beep when turned on.

4-2-1-2 Back-end Processor Boot Up

1.) Press the **On / Off switch** on the Control Panel once.

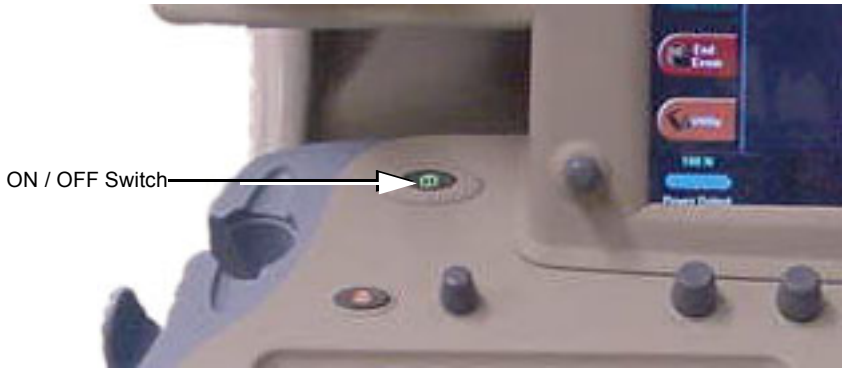


Figure 4-3 On / Off switch for Back-end Processor Boot Up

When the **On / Off switch** on the Control Panel is pressed once, the Back-end Processor starts and the software code is distributed to initiate the scanner.

No status messages are displayed during this process.

4-2-2 Standby Mode

Use Standby Mode to decrease the power off/on time while transporting your system for a portable exam. To place the system in standby mode:

NOTE: DO NOT put the system in Standby Mode more than 20 times in a row. You should power down the system daily.

4-2-2-1 Place System in Standby Mode:

1.) Press the On/Off switch at the front of the system once. The System-Exit window displays.
2.) Use the Trackball to select STANDBY.

NOTE: The Monitor Display and Touch Panel turn black. The On/Off switch indicator is green.

It takes approximately 30 seconds to go into Standby Mode. The system does not fully enter Standby Mode until the LED on the hard drive gives a quick flash or the on off switch begins blinking.

NOTE: Starting with BT04 systems, the On/Off Switch will blink while the system is in Standby Mode. Because of a hardware dependency, this feature is not supported on systems that are upgraded to BT04.

3.) Unplug the system from the wall. The system beeps.

NOTE: DO NOT press the On/Off switch while the system is unplugged, this will turn the system off.

4.) Transport the system as needed and plug it back in within 12 minutes. If the system is unplugged for longer than 20 minutes, the battery is discharged and the system shuts down.

NOTE: It takes four hours to recharge the battery.

See Moving the System in the Basic User Manual for more information.

4-2-2-2 Waking the System from Standby Mode:

1.) Press On/Off switch **QUICKLY**! Less than .25 seconds. If you press the On/Off switch too long the system will shutdown. It takes about 45 seconds for the system to become fully functional.

NOTE: If the On/Off switch is pressed too long, the system shuts down instead of coming out of Standby Mode.

NOTE: Waking the system from Standby without AC connected will turn off the system.

4-2-3 Power Off / Shutdown

NOTE: After turning off a system, wait at least ten seconds before turning it on again. The system may not be able to boot if power is recycled too quickly.

4-2-3-1 Back End Processor Power Off

1.) Press the **On / Off switch** on the Control Panel once to display the SYSTEM - EXIT menu.
2.) Select SHUTDOWN from the SYSTEM - EXIT menu.
3.) Allow the system to close files and shutdown. Wait until the standby light turns amber.

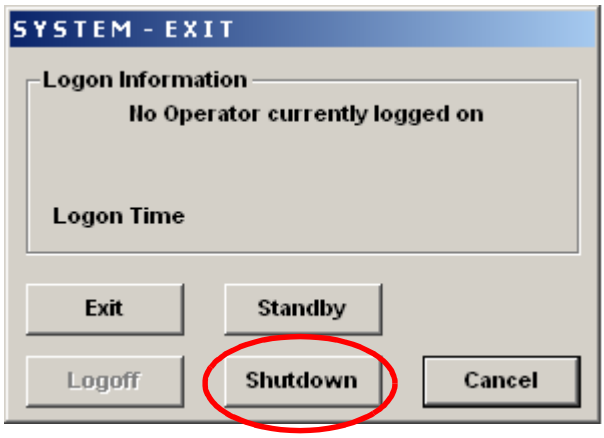


Figure 4-4 System Exit Menu for Back-end Processor Power Down

4-2-3-2 Scanner Shutdown



Figure 4-5 Circuit Breaker and Power Cable on Back of Scanner

1.) From the rear of the system, switch OFF the Circuit Breaker.

NOTICE Disconnecting the Mains Power Cable *before* switching OFF the Circuit Breaker will activate the uninterruptible power system (UPS) in the backend processor, forcing an ordered shutdown of the system.

NOTICE The UPS serves *only* as a battery backup that allows for a soft shut-down of the scanner to prevent file corruption. **IT DOES NOT REGULATE INCOMING VOLTAGE**.

WARNING ***Disconnecting the Mains Power Cable is required before servicing or relocating the scanner.***



For USA only:
Follow OSHA Lockout/Tagout requirements by ensuring you are in total control of the electrical Mains Power Cable plug.

2.) Slip the Cable Clip off the shoulders on the molded plug, then disconnect the Mains Power Cable from the scanner.

4-2-4 System Features

4-2-4-1 Control Panel

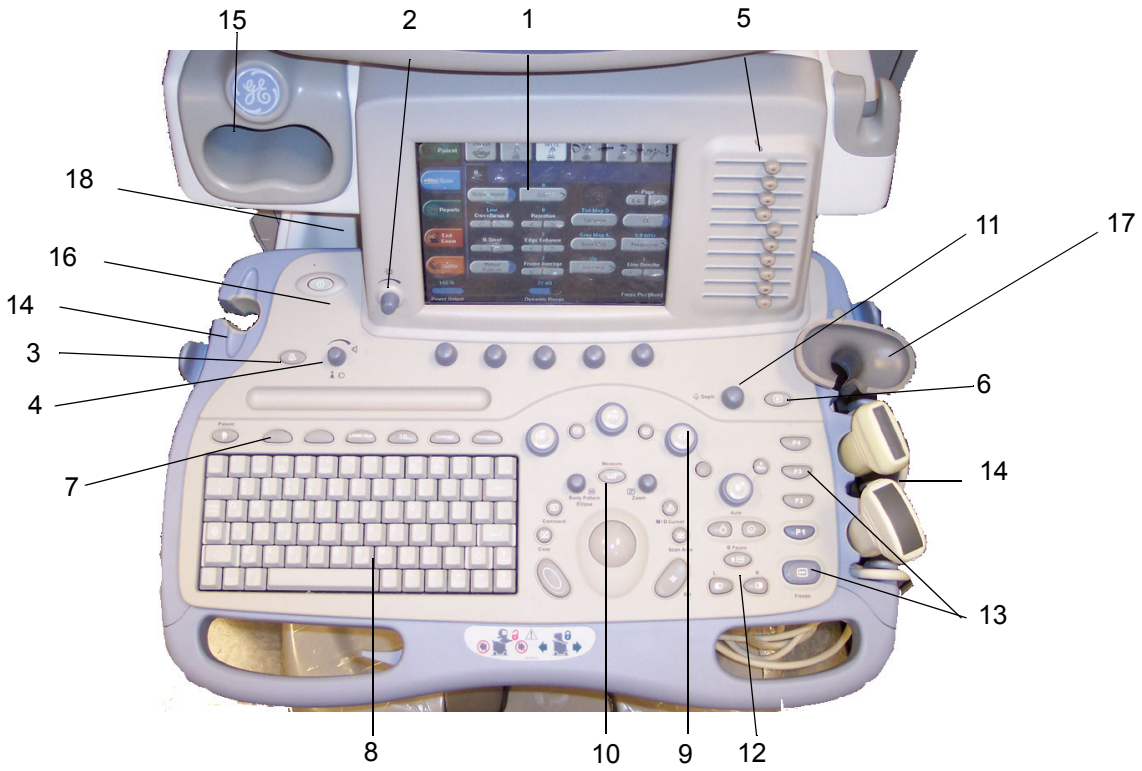


Figure 4-6 Control Panel Tour

1. Touch Panel and Controls	10. Imaging/Measurement Keys
2. Touch Panel Brightness Control	11. Depth
3. Video	12. Imaging Feature Keys
4. Audio On/Off and Volume	13. Freeze and Print Keys
5. TGC	14. Probe Holder
6. Reverse	15. Gel Holder
7. Additional Feature Keys	16. On/Off Switch
8. Keyboard	17. 4D probe holder insert
9. Mode/Gain Keys	18. USB Connector - for wired mic only

4-2-4-2 Touch Panel

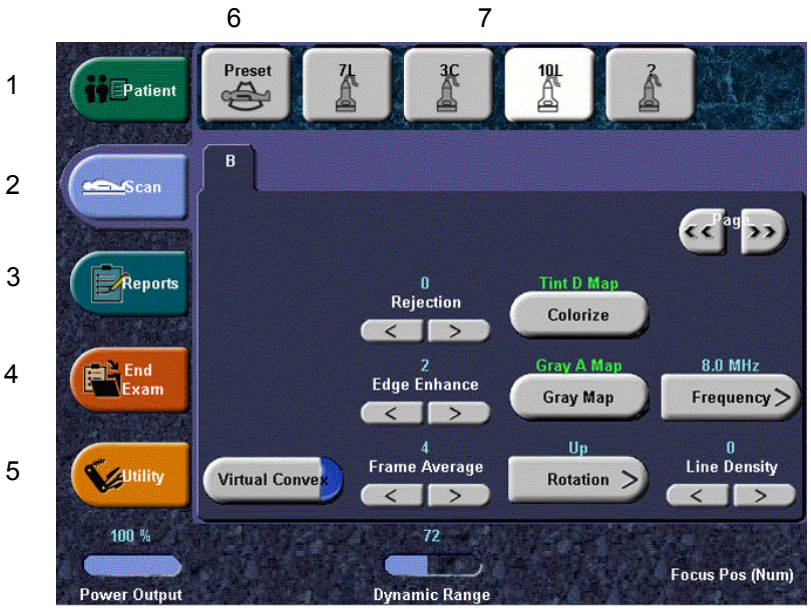


Figure 4-7 Touch Panel Display Tour

1.) Patient: Enter Patient screen
2.) Scan: Enter scanning mode screen
3.) Reports: Activates default report and Touch Panel of report choices.
4.) End Exam: Activates Image Management and Touch Panel with end of exam options.
5.) Utility: Activates the configuration system.
6.) Preset: Select the application to use.
7.) Probe Indicator: Indicates and selects the probes.

NOTE: Different menus are displayed depending on which Touch Panel Menu is selected.

At the bottom of the Touch Panel, there are five combination rotary dials/push buttons. The functionality of these rotaries changes, depending upon the currently displayed menu. Press the button to switch between controls (as with Focus Position/Number), or rotate the dial to adjust the value.

4-2-4-3 Monitor Display

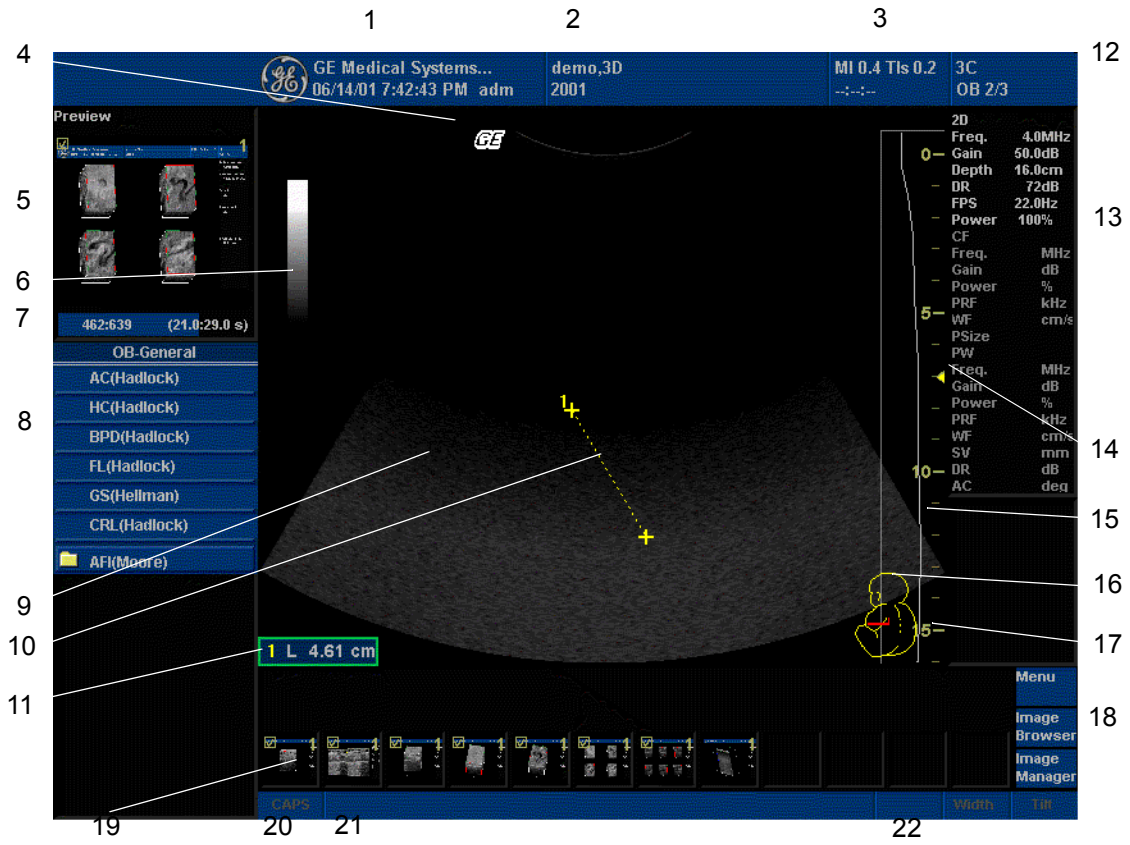


Figure 4-8 Monitor Display Tour

Table 4-3 Monitor Display Features

1. Institution/Hospital Name, Date, Time, Operator Identification.	12. Probe Identifier. Exam Study.
2. Patient Name, Patient Identification.	13. Imaging Parameters by Mode (current mode highlighted).
3. Power Output Readout, System Status (real-time or frozen)	14. Focal Zone.
4. GE Symbol: Probe Orientation Marker. Coincides with a probe orientation marking on the probe.	15. TGC.
5. Image Preview.	16. Body Pattern.
6. Gray/Color Bar.	17. Depth Scale.
7. Cine Gauge.	18. Image Management Menu: Menu, Delete, and Image Manager.
8. Measurement Summary Window.	19. Image Palette.
9. Image.	20. Caps Lock: On/Off.
10. Measurement.	21. System Messages Display.
11. Results Window.	22. Trackball Functionality Status: Scroll, M&A (Measurement and Analysis), Position, Size, Scan Area Width and Tilt.

4-2-5 System B/M-Mode Checks

For a basic functional check of the system's different modes, the Quick Guide will familiarize you with image optimization for **B-Mode**, **M-Mode**, **Color Flow**, and **Doppler**.



Figure 4-9

Table 4-4 B/M-Mode Functions

Power Output (Acoustic Power)	Optimizes image quality and allows user to reduce beam intensity. 10% increments between 0-100%. Values greater than 0.1 are displayed
Dynamic Range	Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.
Focus Number and Position	Increases the number of transmit focal zones or moves the focal zone(s) so that you can tighten up the beam for a specific area. A graphic caret corresponding to the focal zone position(s) appears on the right edge of the image.
Rejection	Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed).
Edge Enhance	Edge Enhance brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to M Mode's edge enhancement affects the M Mode only.
Frame Average	Temporal filter that averages frames together. This has the effect of presenting a smoother, softer image.
Colorize	Enables gray scale image colorization. To deactivate, reselect a Gray Map.
Gray Map	Determines how the echo intensity levels received are presented as shades of gray.
Rotation (Up/Down)	Rotates the image by selecting the value from the pop up menu.

Table 4-4 B/M-Mode Functions

Frequency	Multi Frequency mode lets you downshift to the probe's next lower frequency or shift up to a higher frequency.
Frame Rate/Resolution	Optimizes B Mode frame rate or spatial resolution for the best possible image.
B Flow	Provides intuitive representation of non-quantitative hemodynamics in vascular structures.
Sensitivity/PRI	Adjusts the sample rate for the flow signal.
Background On/Off	Background On lets you view the anatomy roadmap; Background Off lets you view just flow information.
Sweep Speed	Changes the speed at which the timeline is swept.

4-2-6 System CFM and PWD Checks

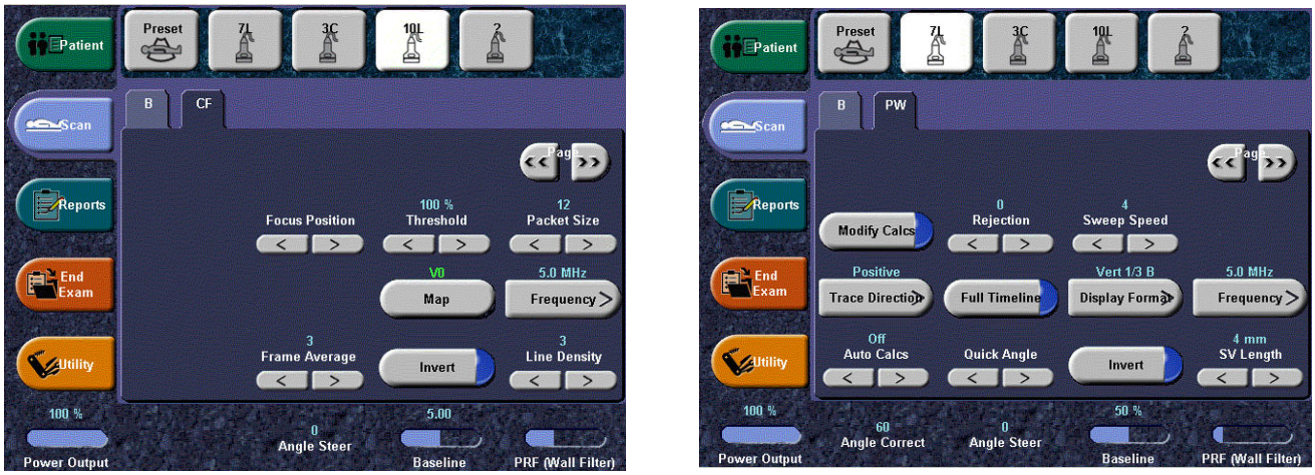


Figure 4-10 CFM and PWD Functions

Table 4-5 CFM and PWD Functions

Baseline	Adjusts the baseline to accommodate faster or slower blood flows to eliminate aliasing.
PRF/Wall Filter	Velocity scale determines pulse repetition frequency. If the sample volume gate range exceeds single gate PRF capability, the system automatically switches to high PRF mode. Multiple gates appear, and HPRF is indicated on the display.
Angle Correct	Estimates the flow velocity in a direction at an angle to the Doppler vector by computing the angle between the Doppler vector and the flow to be measured
Threshold	Threshold assigns the gray scale level at which color information stops.
Map	Allows a specific color map to be selected. After a selection has been made, the color bar displays the resultant map.

Table 4-5 CFM and PWD Functions

Invert	Allows blood flow to be viewed from a different perspective, i.e. red away (negative velocities) and blue toward (positive velocities). The real-time or frozen image can be inverted.
Packet Size	Controls the number of samples gathered for a single color flow vector.
Quick Angle Correct	Quickly adjusts the angle by 60 degrees
Doppler Display Formats	Display layout can be preset to have B-Mode and Time-motion side-by-side or over-under. In the side-by-side layout, there are three display alternatives defined: equal priority, time-motion priority or time-motion with B-Mode reference. In the over-under layout, there are three display alternatives defined: time-motion priority, B Mode priority or equal priority.
Sample Volume Gate Length	Sizes the sample volume gate
Scan Area	Slants the B-Mode or Color Flow linear image left or right to get more information without moving the probe

4-2-7 Basic Measurements

*NOTE: The following instructions assume that you first scan the patient and then press **Freeze**.*

4-2-7-1 Distance and Tissue Depth Measurements

1.) Press **MEASURE** once; an active caliper displays.
2.) To position the active caliper at the start point (distance) or the most anterior point (tissue depth), move the **TRACKBALL**.
3.) To fix the start point, press ***Set***. The system fixes the first caliper and displays a second active caliper.
4.) To position the second active caliper at the end point (distance) or the most posterior point (tissue depth), move the **TRACKBALL**.
5.) To complete the measurement, press **SET**. The system displays the distance or tissue depth value in the measurement results window.

Before you complete a measurement:

To toggle between active calipers, press **MEASURE**.

To erase the second caliper and the current data measured and start the measurement again, press **CLEAR** once.

*NOTE: To rotate through and activate previously fixed calipers, turn **CURSOR SELECT**.*

*NOTE: After you complete the measurement, to erase all data that has been measured to this point, but not data entered onto worksheets, press **CLEAR**.*

4-2-7-2 Circumference/Area (Ellipse) Measurement

1.) Press **MEASURE** once; an active caliper displays.
2.) To position the active caliper, move the **TRACKBALL**.
3.) To fix the start point, press **SET**. The system fixes the first caliper and displays a second active caliper.
4.) To position the second caliper, move the **TRACKBALL**.
5.) Turn the **ELLIPSE** control; an ellipse with an initial circle shape appears.

4-2-7-2 Circumference/Area (Ellipse) Measurement (cont'd)

NOTE: Be careful not to press the Ellipse control as this activates the Body Pattern.

6.) To position the ellipse and to size the measured axes (move the calipers), move the **TRACKBALL**.
7.) To increase the size, turn the **ELLIPSE** control in a clockwise direction. To decrease the size, turn the **ELLIPSE** control in a counterclockwise direction.
8.) To toggle between active calipers, press **MEASURE**.
9.) To complete the measurement, press **SET**. The system displays the circumference and area in the measurement results window.

Before you complete a measurement:

- To erase the ellipse and the current data measured, press **CLEAR** once. The original caliper is displayed to restart the measurement.
- To exit the measurement function without completing the measurement, press **CLEAR** a second time.

4-2-7-3 Worksheets

Measurement/Calculation worksheets are available to display and edit measurements and calculations. There are generic worksheets as well as Application specific worksheets. The worksheets are selected from the Measurement Touch Panel.

4-2-7-4 Report Pages

Measurements/Calculations that are included on the worksheet can also be displayed on Report Pages. Report Pages can be customized to meet the appropriate needs of the user.

4-2-8 Probe/Connectors Usage

4-2-8-1 Connecting a probe

1.) Place the probe's carrying case on a stable surface and open the case.
2.) Carefully remove the probe and unwrap the probe cable.
3.) DO NOT allow the probe head to hang free. Impact to the probe head could result in irreparable damage.
4.) Turn the connector locking handle counterclockwise.
5.) Align the connector with the probe port and carefully push into place.
6.) Turn the connector locking handle clockwise to secure the probe connector.
7.) Carefully position the probe cable in the probe cord holder spot so it is free to move, but not resting on the floor.

4-2-8-2 Activating the probe

Select the appropriate probe from the probe indicators on the Touch Panel.

The probe activates in the currently-selected operating mode. The probe's default settings for the mode and selected exam are used automatically.

4-2-8-3 Deactivating the probe

When deactivating the probe, the probe is automatically placed in standby mode.

1.) Press the ***Freeze*** key.
2.) Gently wipe the excess gel from the face of the probe. (Refer to the Basic User Manual for complete probe cleaning instructions.)
3.) Carefully slide the probe around the right side of the keyboard, toward the probe holder. Ensure that the probe is placed gently in the probe holder.

4-2-8-4 Disconnecting the probe

Probes can be disconnected at any time. However, the probe should not be selected as the active probe.

1.) Move the probe locking handle counterclockwise. Pull the probe and connector straight out of the probe port.
2.) Carefully slide the probe and connector away from the probe port and around the right side of the keyboard. Ensure the cable is free.
3.) Be sure that the probe head is clean before placing the probe in its storage box.

4-2-9 Using Cine

4-2-9-1 Activating CINE

Press **FREEZE**, then roll the **TRACKBALL** to activate CINE. To start CINE Loop playback, press Run/Stop. To stop CINE Loop playback. press Run/Stop.

4-2-9-2 Omitting Images

TRACKBALL to the frame you want to delete and press OMIT IMAGE.

4-2-9-3 Restoring Images

To undo deleting an image from the CINE Loop, press RESTORE IMAGE.

4-2-9-4 Quickly Move to Start/End Frame

Press FIRST to move to the first CINE frame; press LAST to move to the last CINE frame.

4-2-9-5 Start Frame/End Frame

Turn the **START FRAME** dial to the left to move to the beginning of the CINE Loop. Turn the dial to the right to move forward through the CINE Loop.

Turn the **END FRAME** dial to the right to move to the end of the CINE Loop. Turn the dial to the left to move backward through the CINE Loop.

4-2-9-6 Adjusting the CINE Loop Playback Speed

Turn the **LOOP SPEED** dial right/left to increase/decrease the CINE Loop playback speed.

4-2-9-7 Synchronizing Multiple CINE Loops

To synchronize two or more CINE Loops, press SYNC MODE.

4-2-9-8 Disconnecting B-Mode CINE from Timeline CINE

To review the B-Mode CINE Loop only, press CINE MODE SELECTION and select B ONLY.

To review the Timeline CINE Loop only, press CINE MODE SELECTION and select TL ONLY.

To return to linked B-Mode and Timeline CINE Loop review, press CINE MODE SELECTION and select B/TL.

4-2-9-9 Moving through a CINE Loop Frame By Frame

Turn **FRAME BY FRAME** to move through CINE memory one frame at a time.

4-2-10 Image Management (QG)

For Image Management functionality refer to the LOGIQ™ 9 Quick Guide. It talks about several topics:

- Clipboard
- Printing Images
- Browsing and Managing an Exam's Stored Image
- Connectivity, and Dataflow Concept and Creation
- Starting an Exam
- Configuring Connectivity
- TCP/IP
- Services (Destinations)
- Buttons
- Views
- Verifying and Pinging a Device

4-2-11 Using the MOD (Magneto-Optical Drive) For BT03 and prior

The 3.5 inch Magneto-Optical disk drive supports the following densities:

Standard: 640MB; 540MB; 230MB; and 128MB

Overwrite: 1.3GB, 640MB; and 540MB

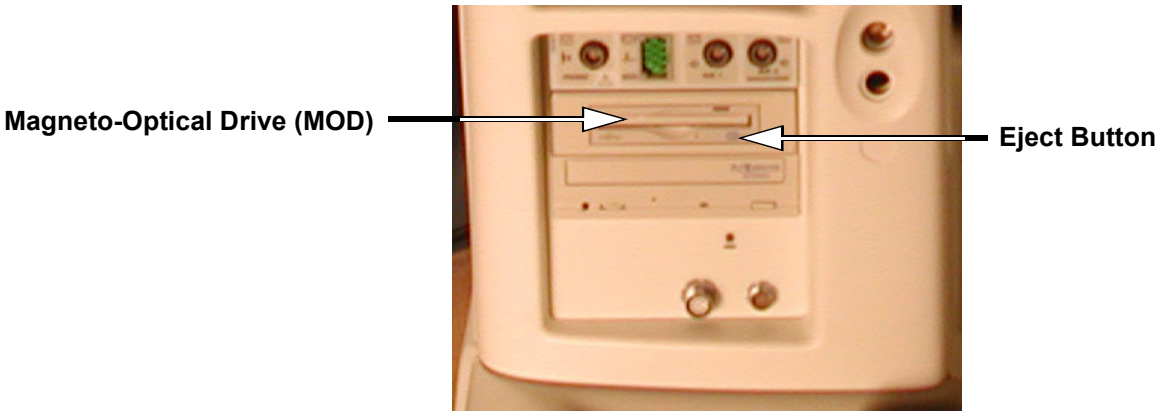


Figure 4-11 Magneto-Optical Drive

1.) Before installing an MO disk in the MOD, check the MO disk for loose hardware or damaged labels which could jam inside the MOD. Also, ensure that the slide switch in one corner of the disk is set so that the disk is write enabled (disk hole closed).

2.) Insert the disk into the MOD with the label facing up.

⚠ **NOTICE** **Never move the unit with a disk in the MOD because the drive actuator will not be locked and the MOD could break.**

3.) There are different methods to eject a disk from the MOD. In some cases disk ejection is automatic. Manual ejection methods are listed below in preferred order from best (1) to worst (4).

a.) When in Archive Menu, use the softkey choice –or– click Image Presets up, then click the left softkey switch up for ARCHIVE, then toggle the switch under EJECT MOD.

b.) Press the **EJECT** switch on the MOD while system is ON.

c.) Press and hold the **EJECT** switch while the system is booting.

d.) Mechanical ejection. Insert the end of a paper clip into the hole next to the **EJECT** switch while system power is OFF.

⚠ **NOTICE** **Avoid mechanical ejection whenever possible. Mechanical ejection leaves the actuator unlocked and the MOD susceptible to damage if moved. If forced to use this method, reboot the system, then insert and eject a known good disk using one of the other manual ejection methods.**

4-2-12 Backup and Restore Database, Preset Configurations and Images

The Backup and Restore procedures vary based on the application software that is installed. For the appropriate Backup and Restore information see the LOGIQ™ 9 Quick Guide.

Table 4-6 Quick Guide Direction Numbers

Application Software Version	Direction Number
R2.X	2309820-100
R3.X	2384458-100
R4.X	5113779-100

Section 4-3
Software Configuration Checks

Table 4-7 Software Configuration Checks

Step	Task to do	Expected Result(s)
1.	Check Date and Time setting	Date and Time are correct
2.	Check that Location (Hospital Name) is correct	Location Name is correct
3.	Check Language settings	Desired Language is displayed
4.	Check assignment of Printer Keys	Print1-4 Keys are assigned as desired by the customer
5.	Check that all of the customer's options are set up correct	All authorized functions are enabled

Section 4-4
Peripheral Checks

Check that peripherals work as described below:

Table 4-8 Peripheral Checks

Step	Task to do	Expected Result(s)
1.	Press (**FREEZE**)	Stop image acquisition.
2.	Press (**PRINT 1**) or (**PRINT 2**) on the Control Panel	The image displayed on the screen is printed on B&W or Color printer, depending on the key assignment configuration
3.	Press **VIDEO** on the Control Panel.	To start the video counter at a different point:
4.	Press **UPDATE MENU** in the Trackball area.	The *Video Set Counter / Search Dialog window* is displayed
5.	Use the **alphanumeric keyboard** to enter the counter number in the counter field.	Number appears
6.	Press **SET COUNTER** to save the change.	Number is saved
7.	Press **VIDEO** on the Control Panel	to return to the scanning mode
8.	Press **REC/PAUSE** on the Control panel.	to Start Recording A red dot is displayed in the *VCR status area* on the *Title bar* to indicate that recording has begun
9.	Press **REC/PAUSE** on the Control panel.	To Stop recording The video status icon is changed to (Pause)
10.	Press VIDEO on the Control Panel and the assignable play	To start, Play back an examination
11.	Use the **Assignable keys** on the *Control Panel*	to perform actions on the recorded session, such as stop, pause, rewind or fast forward. The video status icon in updated accordingly.
12.	While in playback mode, use the **TRACKBALL** to adjust the video playback speed and scroll through the record.	To search on the tape
13.	Press the assignable **PAUSE**	to stop the tape at the desired frame.
14.	When playing back an examination	part of it can be stored on the computer's memory as a cineloop.The cineloop enables the user to perform further operations on the stored section (see for further information on cineloop operation).
15.	Press (**FREEZE**) while playing back a recorded session.	**To store a recorded sequence as a cineloop. The** last few seconds are stored as a cineloop.

Section 4-5
Mechanical Function Checks

4-5-1 Operator I/O Movement



Figure 4-12

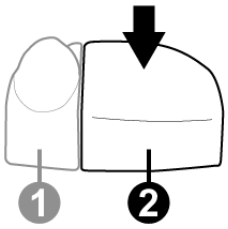
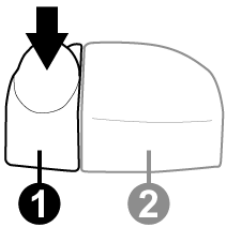
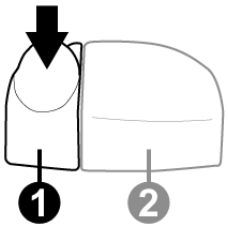
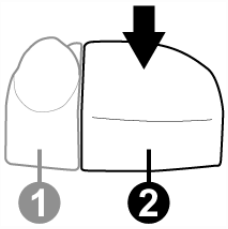
Step	Task	Expected Result(s)
1.	Pull handle up under the platform towards you to release horizontal lock	It is possible to maneuver the Display Platform horizontally at present level of height
2.	Pull handle at left hand grip towards you to release the Vertical Lock	It is possible to maneuver the Display Platform up and down (between the vertical end stops) as long as you pull the handle towards you
3.	Pull both handles towards you to release both Vertical and Horizontal locks	It is possible to maneuver the Display Platform both horizontally and vertically as long as you keep pulling these handles towards you

Table 4-9 Display Platform Maneuverability Checks

4-5-2 Brakes and Direction Locks Checks

Check that the brakes and direction locks function as described below.

Table 4-10 Brakes and Direction Lock Instructions

Step	Task	Expected Result(s)	
1.	Press on pedal no. 2 	To engage the brakes in full lock	
2.	Press on pedal no.1 	To release the brake	
3.	Press on pedal no.1 	To engage swivel lock. You may need to move the system around a little to get the wheels to lock into the locked direction.	
4.	Press on pedal no. 2 	To release swivel lock	

*NOTE: The swivel lock and brake cannot be engaged (pressed down) at the same time since pressing the main brake releases the swivel lock and pressing the swivel lock releases the main brake. Therefore, if the swivel lock is engaged you need to press the main brake pedal (#2) **twice** to lock the scanner from rolling. Once will release the swivel lock and once again will engage the main brake in full lock as stated in step 1.*

Section 4-6
Site Log

Table 4-11 Site Log

Date	Service person	Problem	Comments

Chapter 5
Components and Functions (Theory)

Section 5-1
Overview

5-1-1 Purpose of Chapter 5

This chapter explains LOGIQ™ 9's system concepts, component arrangement, and subsystem function. It also describes the Power Distribution System (PDS) and probes.

Table 5-1 Contents in Chapter 5

Section	Description	Page Number
5-1	Overview	5-1
5-2	General Information	5-2
5-3	Front End Processor	5-5
5-4	Back End Processor (BEP 1)	5-20
5-5	Back End Processor (BEP 2)	5-25
5-6	Back End Processor (BEP 3)	5-31
5-7	BEP Power On Path	5-36
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5-9	Operator Console Control PWA	5-38
5-10	Patient I/O (Currently not supported by the LOGIQ™ 9)	5-45
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5-14	External I/O	5-55
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Section 5-2
General Information

LOGIQ™ 9 is a phased and linear array ultrasound imaging scanner. It has provisions for analog input sources like ECG and Phono. A Doppler probe may also be connected and used.

The system can be used for:

- B-Mode
- M-Mode
- Color Flow Mode (CFM)
- Power Doppler Imaging (PDI) with topographic and directional maps
- PW Doppler with high PRF
- B-Flow Mode
- M-Color Flow Mode2D Gray Scale and 2D Color Flow Imaging

LOGIQ™ 9 is a digital beamforming system. Signal flow travels from the Probe Connector Panel to the Front End Electronics, to the Back-End Processor, and finally displayed on the monitor and peripherals. System configuration is stored on the hard drive and all necessary software is loaded from the hard drive on power up.

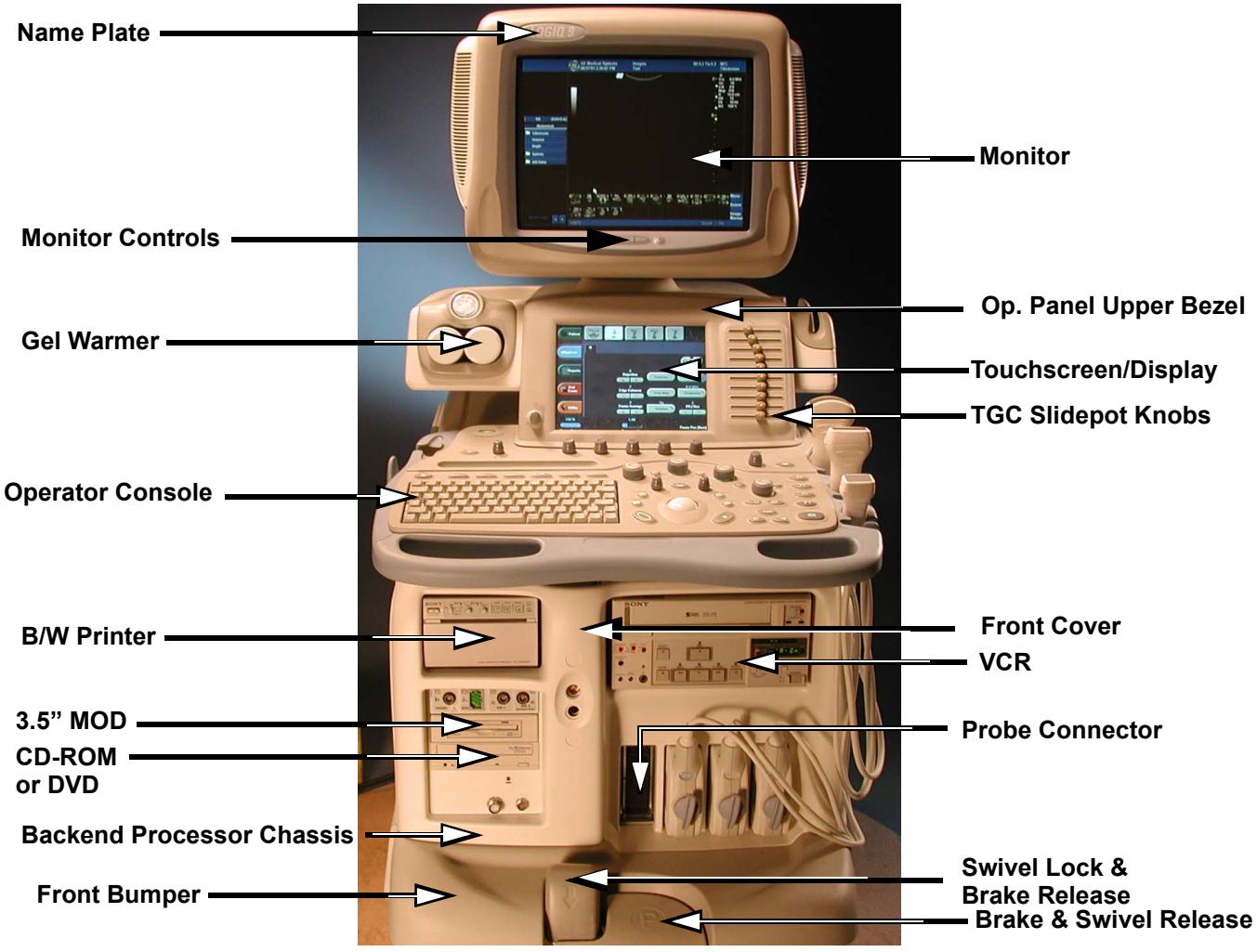


Figure 5-1 LOGIQ™ 9 Major Components

5-2-1 Block Diagram

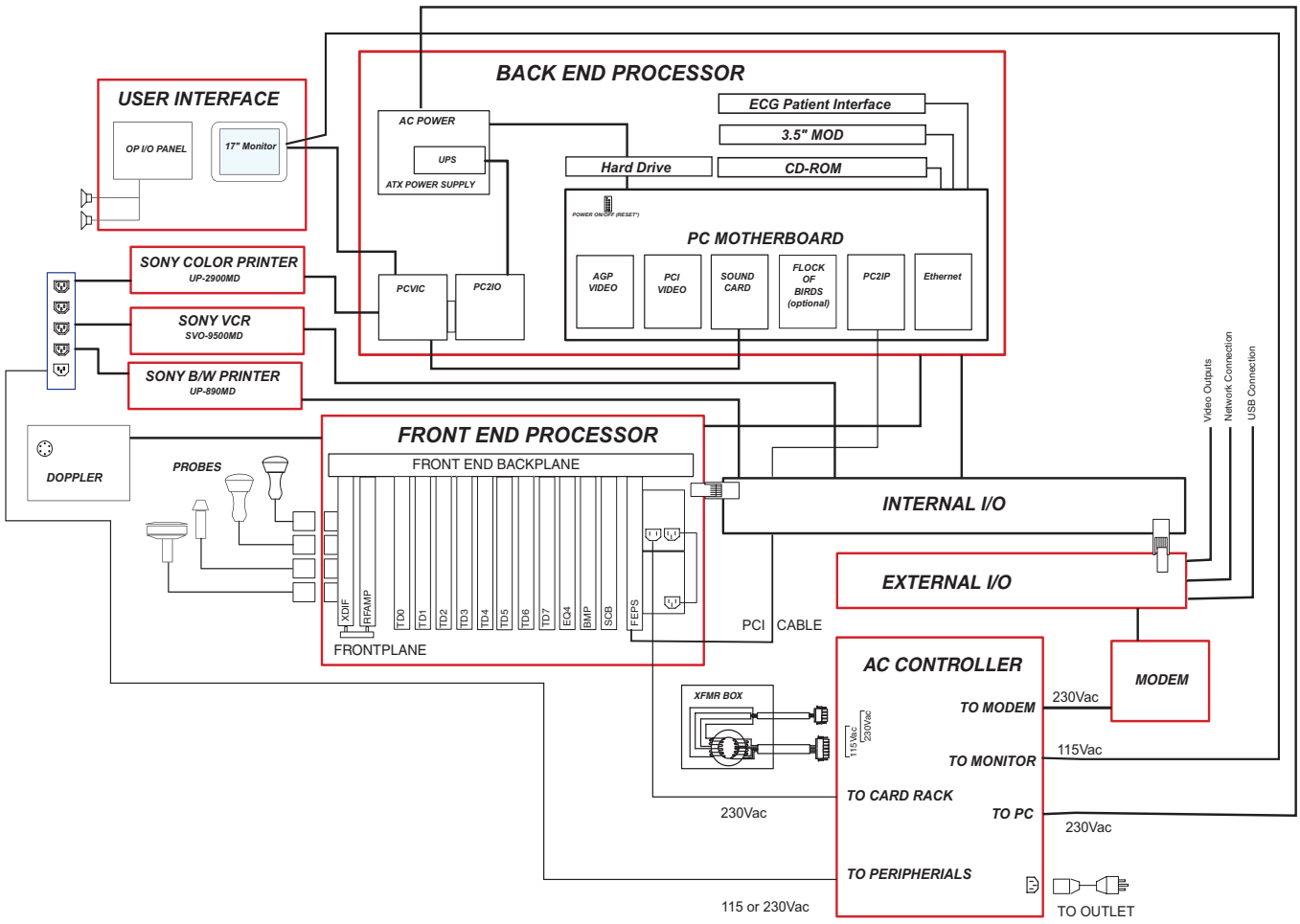


Figure 5-2 LOGIQ™ 9 Simple Block Diagram

5-2-2 Dataflow Control Description

5-2-2-1 Data Sets

Each scan mode will produce data to a corresponding data set in the Image Memory. The data sets are represented in ring-buffers. Each active data set will be allocated to one of the following types of acquisition data:

- 2-D tissue data
- Doppler data
- M-mode data
- 2-D Color flow
- Trace data
- Video Y-component data
- Video UV-component data
- Color M-mode data
- RF data

Section 5-3
Front End Processor

The Front End Processor generates the strong bursts transmitted by the probes as ultrasound into the body. It also receives weak ultrasound echoes from blood cells and body structure, amplifies these signals and converts them to a digital signal.

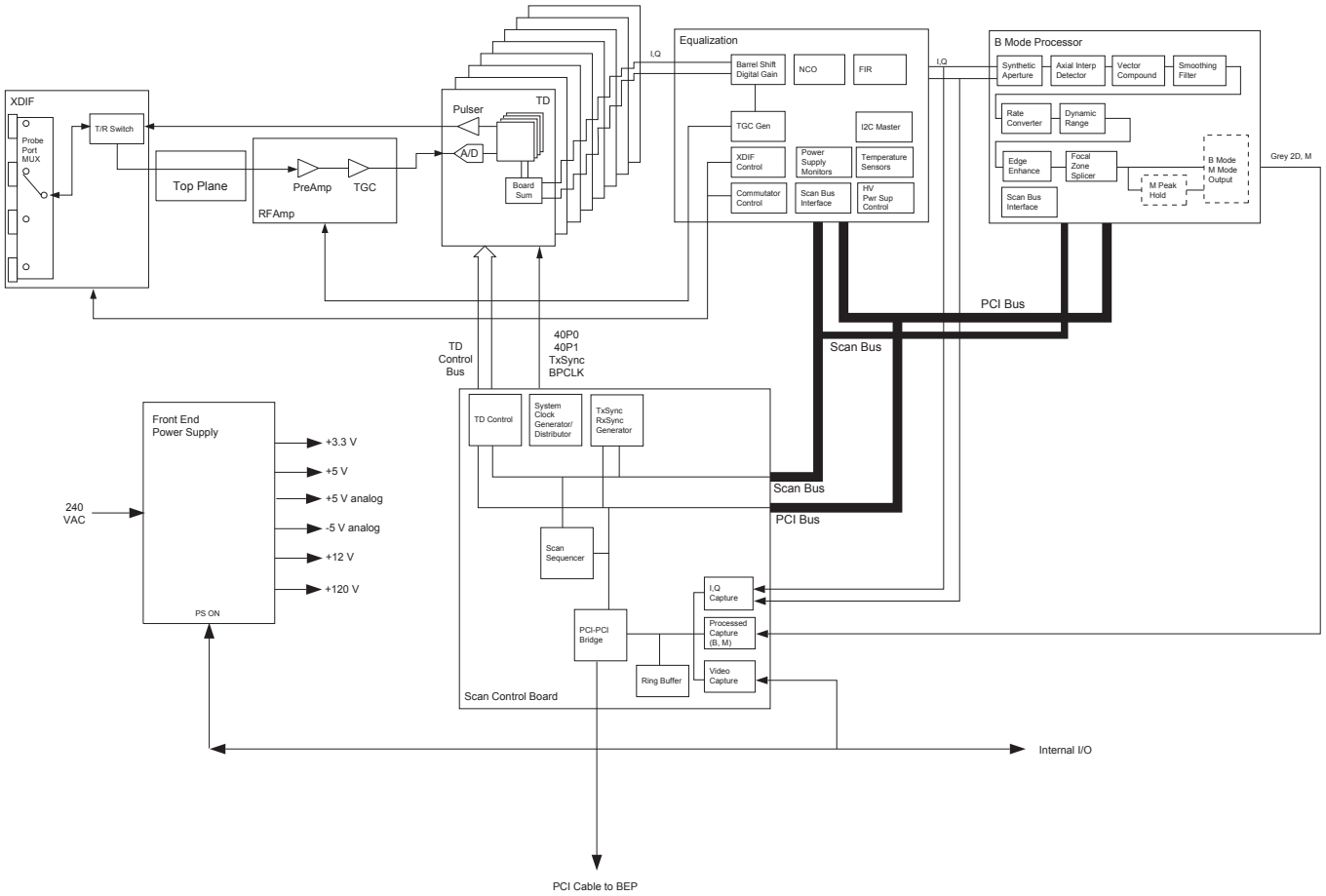


Figure 5-3 The Front End

5-3-1 Front End Processor Power Supply Board (FEPS, FEPS2, FEPS2.1)

The power supply assembly receives approximately 220VAC from the secondary side of the mains isolation transformer.

The FEPS assembly supplies DC regulated power to the Front End card rack of the LOGIQ™ 9. The assembly is configured as a PCB which fits into the right-most slot of the Front End card rack. It interfaces with the back plane to supply power to the Front End circuit boards.

A general enable signal (**PS_ON**) controls enabling and disabling all FEPS Low Voltage outputs. These include +5VA, -5VA, +5V, 3V3, +12V, and +15V (all except PHVP 'High Voltage'). An Enable circuit on the FEPS detects when **PS_ON** becomes valid and holds all outputs off until then.

5-3-1 Front End Processor Power Supply Board (FEPS, FEPS2, FEPS2.1) (cont'd)

The high voltage lockout circuit monitors the +5VA, -5VA, +12VA and 3V3 supplies and locks out the PHVP supply in the event that any one of them go below 10% of their nominal value.

PWR_OK is an active high TTL compatible output which provides a status indication of the AC input power. It should be capable of sinking 5mA maximum. The signal switches to a TTL 'High' when the AC input voltage reaches the minimum specified input level at power up. Upon loss of input voltage, **PWR_OK** will go 'Low'.

5-3-1-1 FEPS3

The FEPS3 Board was introduced with R3.0.0 Software and BT'03. It is not backward compatible with prior hardware as it provides the new voltages (+/- 6V and 13V) required by the TD5s and RFAMP2.

Table 5-2 FEPS, Output Comparison

System Name	FEPS, FEPS2, FEPS2.1 Nominal Output	FEPS3 Nominal Output
5VPA	+5.05V	**+6.0V**
5VNA	-5.05V	**-6.0V**
5VP	+5.05V	+5.05V
3V3	3.33V	3.33V
PHVP	+121.2V / +24.2	+121.2V / +24.24V
12VP	12.12	**13.0V**
15VP	+15.15	+15.15

5-3-2 Front End Subsystem

The LOGIQ™ 9 Front End Subsystem consists the XDIF (Transducer Interface) board, RF Amp board and eight TD (Transmit Delay) boards.



Figure 5-4 Basic Front End SubSystem

The Front End Subsystem provides 128 receive and 128 transmit channels as well as gain and bandpass filtering of the received signal.

5-3-2-1 XDIF (Transducer Interface) Board

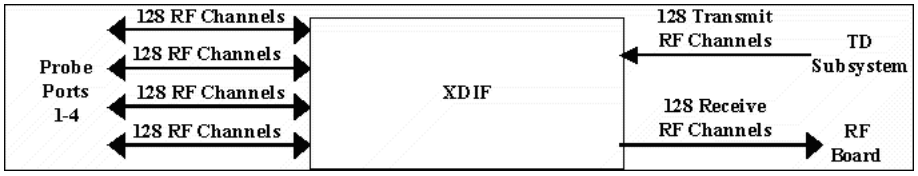


Figure 5-5 XDIF Board Functions

The XDIF supports four 128 Channel probe ports with the ability to select one of the four probe ports. The XDIF supports a probe multiplexer requiring a 200V (+100V and -100V). The multiplexer in the probe will select 128 of the out of up to 192 channels.

The XDIF uses a T/R (Transmit/Receive) switch on each output to the RF Amplifier board. During transmit the T/R switch prevents the high voltage transmit pulser from damaging the receive preamplifier. During receive the T/R switch isolates the receive preamp from the transmit high voltage pulser.

5-3-2-2 Top Plane

Connects the receive signals from the XDIF board to the RF Amplifier board at the front of the circuit boards.

5-3-2-3 RF Amp, RF Amp1.2, RF Amp2 Board (Radio Frequency Amplifier Board)

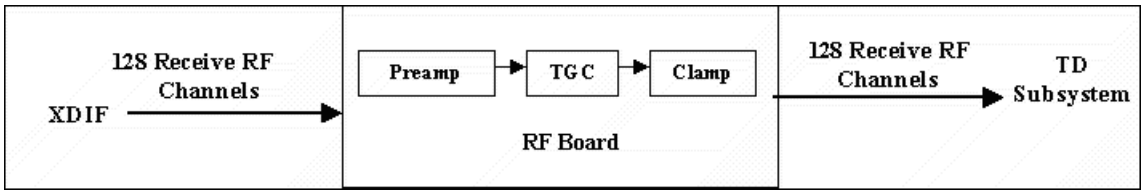


Figure 5-6 RF Amp, RF Amp2 Functions

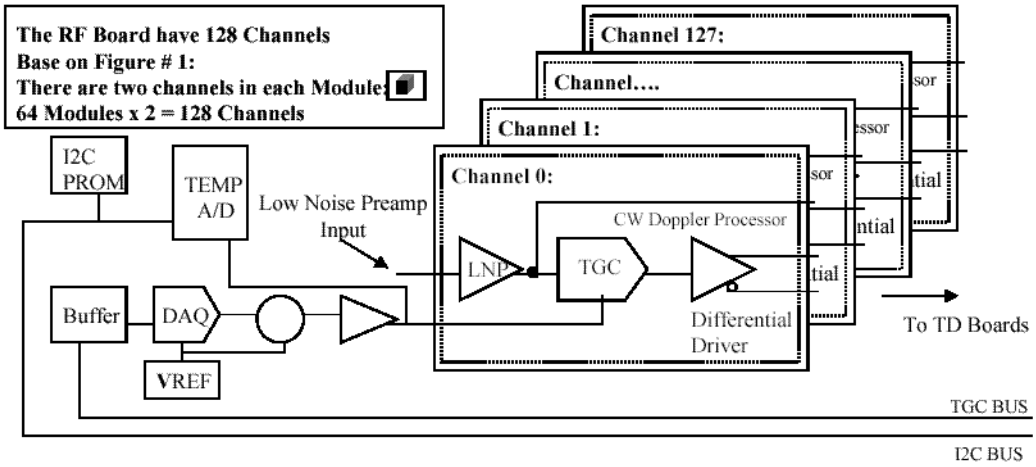


Figure 5-7 RF Amp Board Functional Block Diagram

The RF Amplifier board shall contain 128 channels of the circuitry that is necessary to amplify the small electronic echo signals that are received from the probe transducers. Each channel shall consist of a low-noise, active input termination preamplifier, a time-gain compensation (TGC) amplifier, and a low noise differential drive amplifier (buffer). The RF Amp board shall physically reside in the Beamformer card cage adjacent to the XDIFF board.

The probe level analog input signals shall enter the RF Amp board on a series of board to board connectors that mate the RF Amplifier Board to the XDIFF Board. These connectors carry the transducer level receive signals that originate at the probe and make their way through the probe interface relays, and T/R switches. The digital interface, power supplies, and reference ground shall be provided to the RF Amp board by the system backplane.

Each amplified signal generated by the RF Amp board shall provide a differential output and drive filter circuitry located on the TD boards via the system backplane. The TD boards perform an anti-alias filtering operation and convert the transducer signals to a 12 bit data stream that feeds the digital beamforming electronics.

RF Amp2 Board

The RF Amp2 Board was introduced with R3.0.0 Software and BT'03. It is not backward compatible with prior hardware as it requires the new voltages (+/- 6V and 13V) provided by the FEPS3 Board.

5-3-2-4 TD, TD4, TD5, TD5.1 (Time Delay) Boards (8)

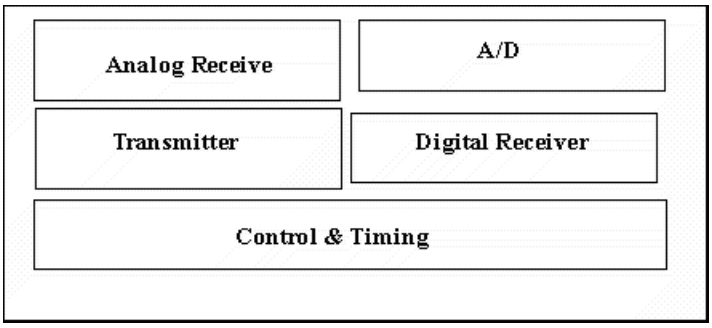


Figure 5-8 Basic TD Board Functions

Major functions of the TD boards are:

- Transmitter
- Analog Receive
- A/D (Analog to Digital conversion)
- Digital Receiver (Rigel Beamformer Chip)
- Control & Timing

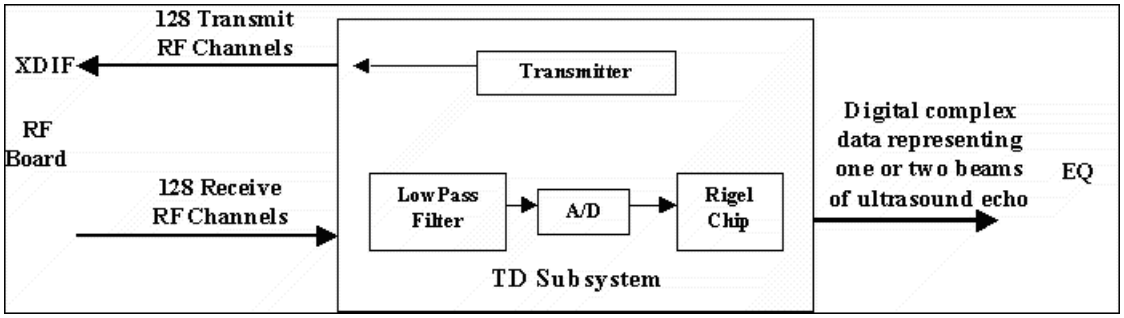


Figure 5-9 Basic TD Input/Output Signals

The TD (Time Delay) boards send 128 transmit signals to the XDIF board. The 128 receive channels from the RF board get low pas filtered, converted from analog to digital and then use the Rigel beamformer chip to generate complex digital data signals representing one or two beams of ultrasound echo information sent to the EQ board.

5-3-2-4 TD, TD4, TD5, TD5.1 (Time Delay) Boards (8) (cont'd)

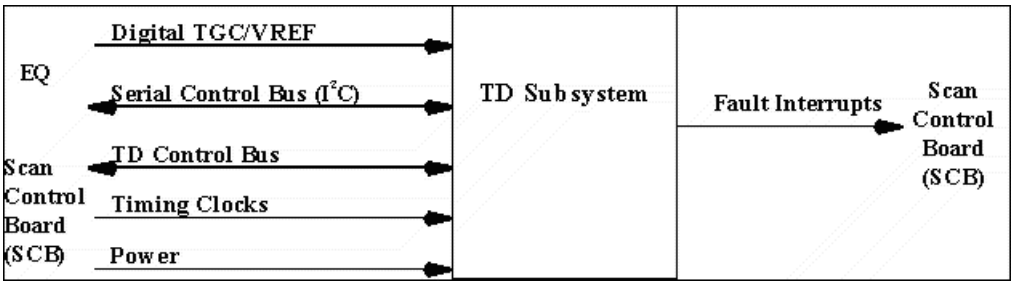


Figure 5-10 Basic TD Input/Output Control Signals

Major control signal from the EQ board are the Digital TGC/VREF and Serial Control Bus (I^2C). Control signal between the Scan Control board consist of Power, Timing Clocks, TD Control Bus and Fault Interrupts

Time Delay (TD, TD4, TD5) Board Function Summary:

- Each board assigned to a subset of 16 channels.
- Generates and amplifies the excitation waveform for each channel.
- Digitizes the input RF signal from the RF Amplifier board.
- Applies dynamic apodization, dynamic receive delays, and filters to the digitized RF signal.
- Automatically adapts receive beams for speed or resolution depending on scans.
- Sums detected echo channel to channel, then board to board. (Boards must be contiguous.) The last TD forwards the total output to the EQ.
- Monitors current consumed for transmit and issues a fault signal if overcurrent is detected.

TD5 and TD5.1(Time Delay 5)

The TD5 Board was introduced with R3.0.0 Software and BT'03. It is not backward compatible with prior hardware as it requires the new voltages (+/- 6V and 13V) provided by the FEPS3 Board.

TD5.1 has same functionality as TD5 but larger and fewer ASICs. You can mix TD5s and TD5.1s

5-3-3 Scan Control Board (SCB, SCB2)

The Scan Control Board combines onto one board the basic functionality of Image Port (IP), Front End Control and Timing (FECT), Scan Sequencer (SS2) and the Scan Trigger (System Timing).

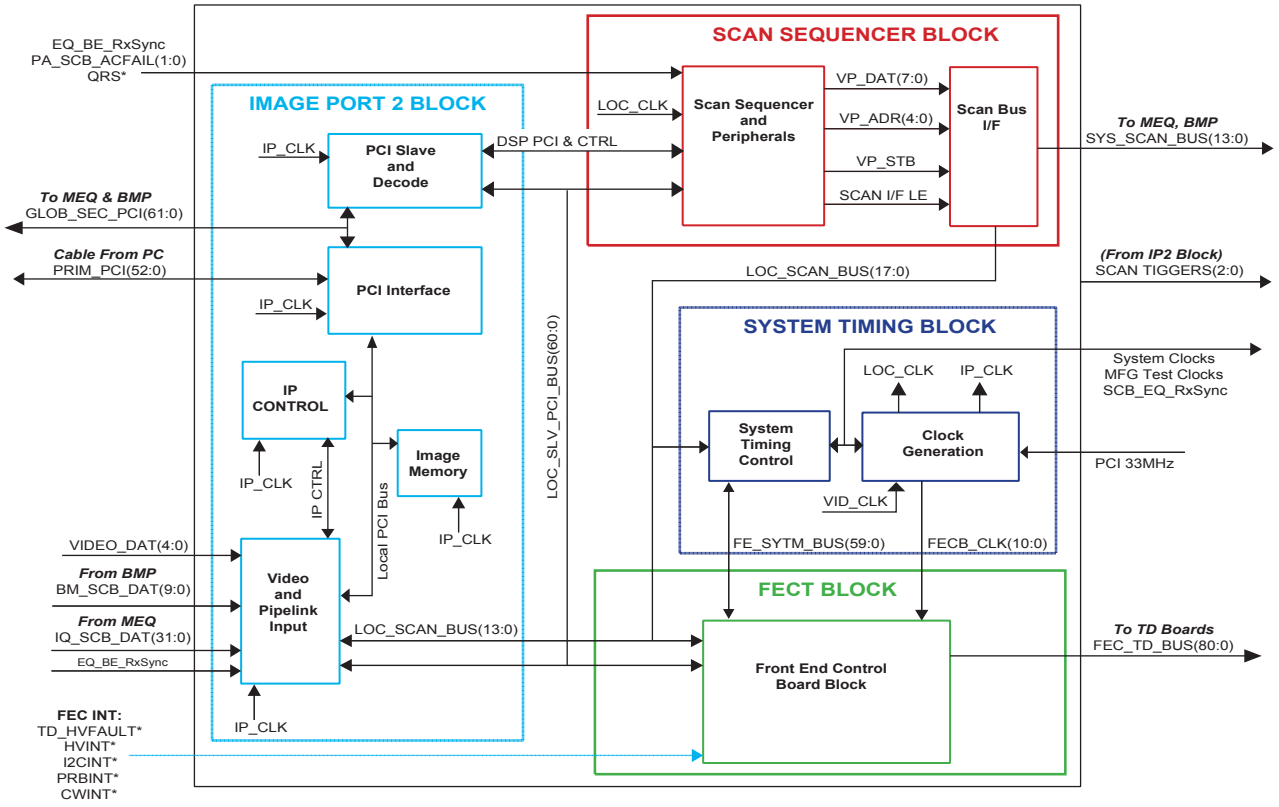


Figure 5-11 SCB Simplified Block Diagram

5-3-3-1 SCB, SCB2 High Level Features

- Generates and buffers system clocks:
  - 40 MHz (40P0 and 40P1)
  - 10 Mhz (BPCLK)
  - TXSync
  - RxSync
- Configures the beamformer to fire B/M-Mode, Color, or PW Doppler vectors.
- Controls scan sequencing in real-time; setting the vector firing order and timing intervals.
- PCI interface to Back End Processor (BEP), BMP, and EQ or EBM/EBM2.
- Buffers B/M data from BMP/EBM/EBM2, data from the EQ/EBM/EBM2 (for Color and PW Doppler), and video data from the VCR to transmit to the BEP for software processing and display.
- Interface between Host PCI and TD boards.

5-3-3-2 Compatibility

Only SCB2 Boards should be used with R3.0.0 software and greater

5-3-3-3 Scan Control Board LEDs

Table 5-3 SCB LED Indications

Function Monitored	LED Number	LED Color	LED Function
I960 Processor	DS1	Red	i960 Fail
	DS2	Yellow	i960 Local Bus Activity
Image Port	DS3	Red	Toggles during Image Port Frames
	DS4	Green	Toggles during Image Port Frames
	DS5	Yellow	IP Master Enable
	DS6	Yellow	IP Master Ready
Pipelink	DS7	Red	IQ Left FIFO Error
	DS8	Red	IQ Right FIFO Error
	DS9	Red	BM FIFO Error
	DS10		FIFO's Empty
Scan Sequence	DS11	Red	Crash
	DS12	Yellow	FIFO Error
	DS13	Yellow	Command Pulse
	DS14	Yellow	Unused
	DS15	Yellow	Pause
	DS16	Green	Unused
	DS17	Green	Happy Light - Toggles during Scan Sequence
	DS18	Green	Happy Light - Toggles during Scan Sequence

Table 5-4 SCB2 2365739 LED Indications

LED Number	LED Color	LED Function
DS1	Green	FPGA Programming Done (Passed)
DS2	Red	i960 Fail
DS5	Green	Toggles during Image Port Frames
DS6	Red	Toggles during Image Port Frames
DS7	Red	Crash
DS8	Yellow	FIFO Error
DS9	Yellow	Command Pause
DS10	Yellow	Unused
DS11	Yellow	Pause
DS12	Green	Unused
DS13	Green	Happy Light (toggles during Scan Sequence)
DS14	Green	Happy Light (toggles during Scan Sequence)

5-3-4 Equalization (EQ) Board

5-3-4-1 General Description

The EQ dynamically gains and filters the received signal output from the final beamformer sum. TGC control calculates range dependent analog and digital gains. The digital gain is applied to the I/Q signal. The gained signal is then rotated in frequency to place the frequency of interest in the passband of the subsequent FIR lowpass filter. The rotator center frequency may also be range dependent. These controls, and the selection of the FIR coefficients may also be processing bank, vector number, or transmit focal zone dependent.

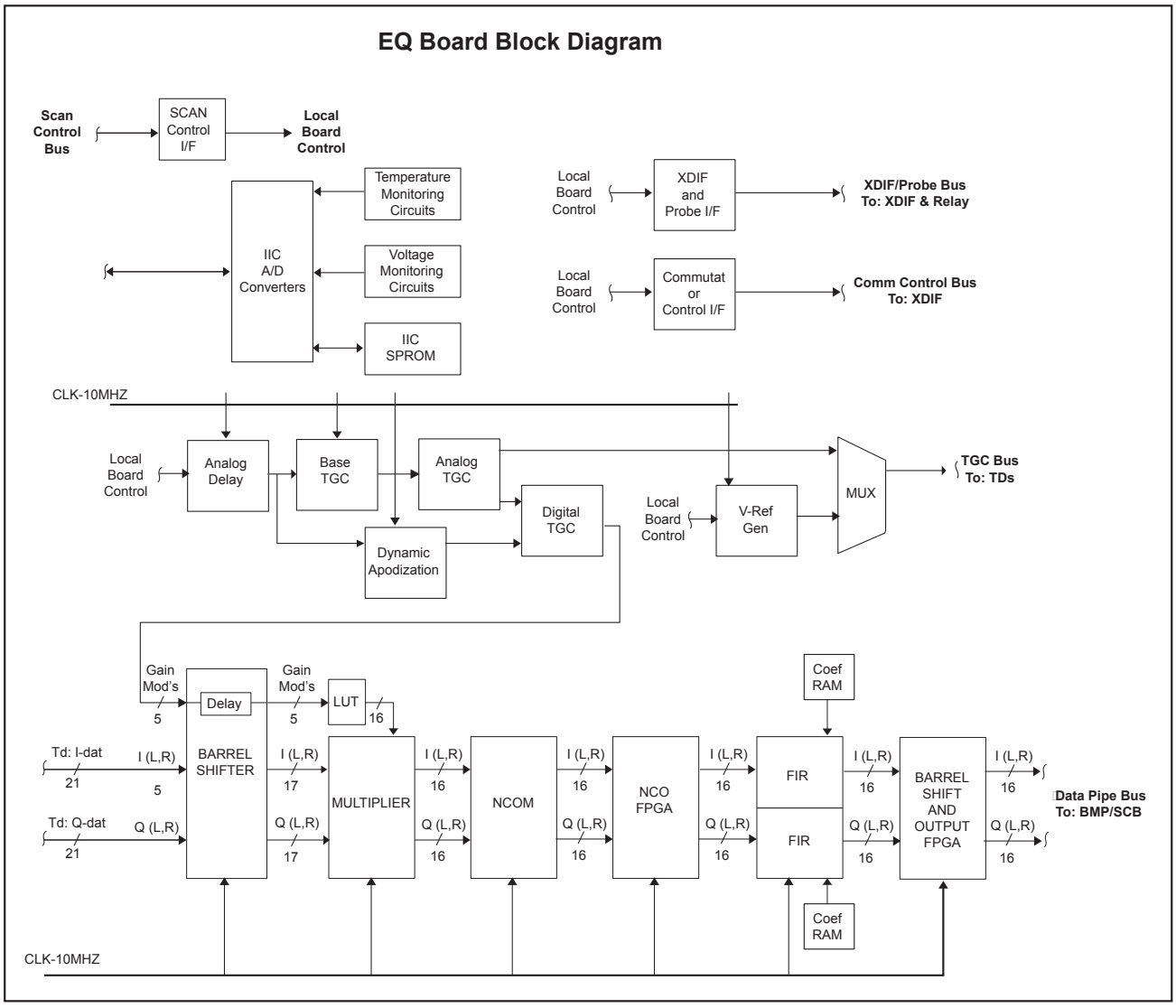


Figure 5-12 EQ Board Block Diagram

5-3-4-2 Basic Functions

- Compensates for the attenuation of the transmitted signal in tissue by depth: performs TGC based on focal zone.
- Compensates for frequency shift (TFC) in tissue, needed in B-Mode and M-Mode.
- Filters out harmonics and optimizes signal to noise ratio.
- Delivers amplified and corrected I & Q data to the BMP and the Scan Control Board.
- Interfaces probe detection and probe ID signals between the XDIF and the host.
- Controls transducer commutator (multiplexer) for muxed probes with more elements than channels in the beamformer.
- Monitors active probe temperature.
- Masters the front end (FE) I2C busses for voltage and temperature monitoring.
- Turns off PHVP on the card rack power supply if a TD board pulls too much power or malfunctions.

5-3-5 B/M Mode Processor (BMP) Board

5-3-5-1 General Description

The B/M-mode Processor (BMP) subsystem takes the digital complex data from the EQ subsystem and converts it to either B-mode (2D) or M-mode (timeline) data.

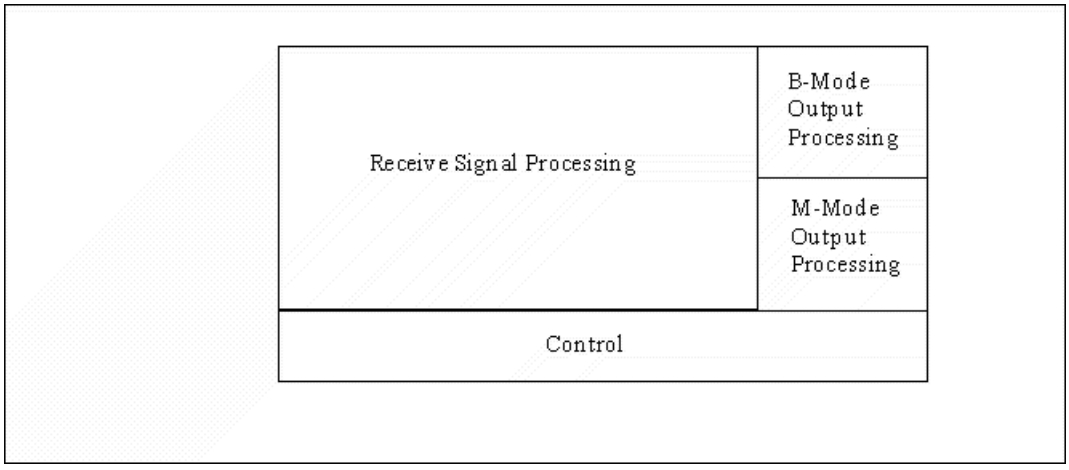


Figure 5-13 BMP Internal Functions

- Processes I & Q data for B-Mode and M-Mode imaging.
- Calculates echo signal's amplitude.
- Converts sample rate to display rate.
- Implements dynamic range and edge enhancement.
- Splices multiple focal zones into one image.
- Sends processed B/M data to the Scan Control Board.

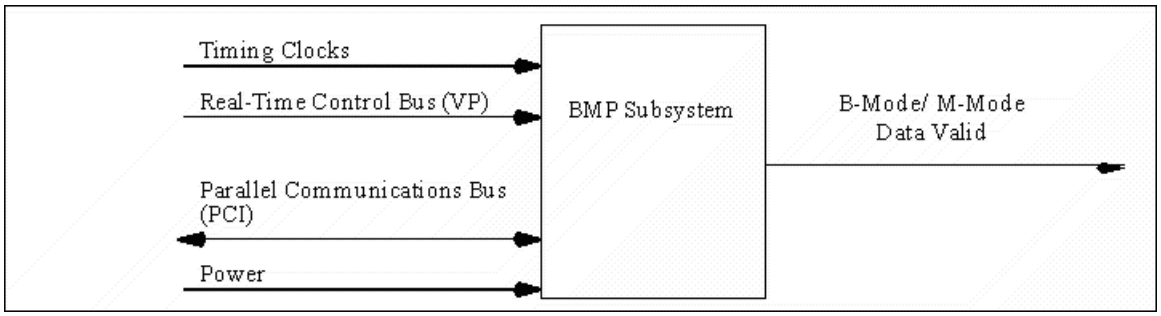


Figure 5-14 BMP Control Inputs/Outputs

5-3-6 EBM, EBM2 Board

The EBM Board was used on forward production units starting with BT'02 (November 2002). The EBM2 Board was used on forward production units starting with R3.0.0 Software (BT'03 October 2003). The detailed functionality is found in the previous EQ and BMP sections.

5-3-6-1 Overview

The EBM/EBM2 board is the data path interface board between the last Time Delay board (TD) and the Scan Control Board (SCB). The EBM/EBM2 receives data from the Time Delay boards, processes the

data for depth attenuation effects, and passes the data on to the B/M processor, then to the Scan Control Board. This board is composed of two main sections the Equalization (EQ) and the B/M Mode Processor (BMP).

The EQ section compensates for the attenuation of ultrasound in tissue. The attenuation of ultrasound in tissue is usually modeled as being linearly dependent on frequency and depth. The EQ section provides two major data processing functions to compensate for this phenomenon, Time Gain Control (TGC), and Time Frequency Control (TFC). Using TGC and TFC, the EQ ”equalizes” image signals by removing depth dependent attenuation effects from the signal, hence the name ”equalization” board. In layman terms, the EQ gives a point deeper in the body an equal opportunity to contribute to the ultrasound image as one closer to the body’s surface.

The BMP section process IQ Vectors from the EQ to create B and M mode vectors. This design is composed of 12 major blocks; Synthetic Aperture, Axial Interpolator, Detector/Vector Compounder, Smoothing Filter, Rate Converter, Dynamic Range Compression, Edge enhance, Splicer, B–Mode Output, M–Mode Output, Vector Configuration and the PCI Interface.

5-3-6-2 Modes of Operation

The EBM/EBM2 equalization design section supports two input data buses from the final summer of the TD board set. The two buses are referred to as the I and Q data buses (or pipes). Each two’s complement bus is 24 bits wide and passes data from the final TD board to the EBM/EBM2 board. Different system modes of operation cause the two data pipes to handle data in different ways. The EBM/EBM2 board transfers output data to the Scan Control Board over two, two’s complement sixteen bit I and Q buses. Internal EBM/EBM2 board data pipes are sixteen bit two’s complement format.

5-3-6 EBM, EBM2 Board (cont'd)

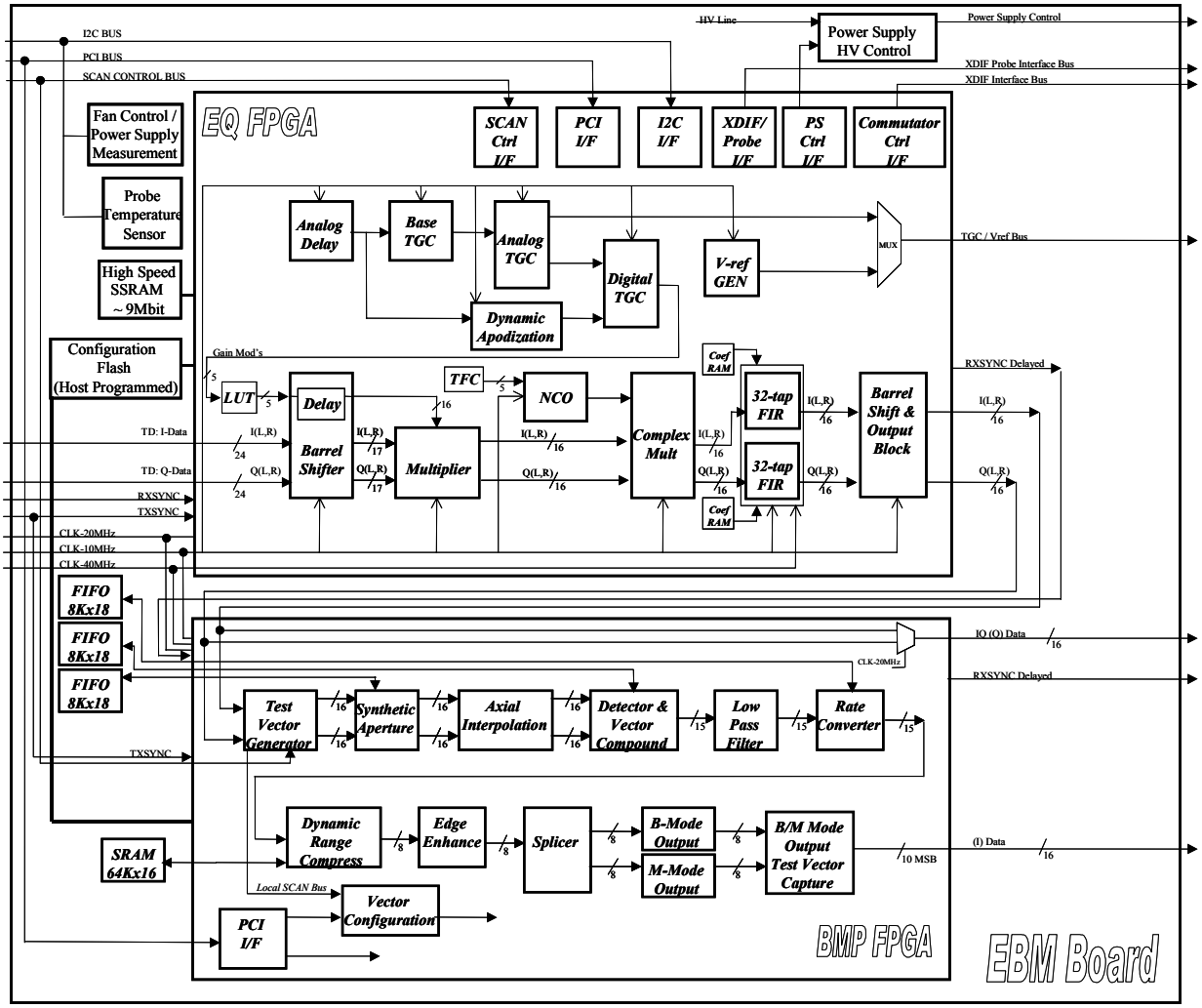


Figure 5-15 EBM/EBM2 Board Block Diagram

5-3-6-3 EBM/EBM2 Interface with XDIF relay board

The EBM/EBM2 EQ section supports an eight-bit read/write data interface to the XDIF relay board. The interface is used to transfer commutator control information to the selected probe and provides host access to the XDIF relay board itself. The EBM/EBM2 board monitors four probes present and four probe hook lines from the XDIF relay board. The EBM/EBM2 EQ section monitors the lines, and generates an interrupt signal when any of the signals change state. The interrupt signal will be debounced to limit the frequency with which probe interrupts may be generated. The EBM/EBM2 board also measures the temperature of the selected probe over two lines from the XDIF relay board. The SCE pulse signal connected to the EBM/EBM2 EQ section in order to be able to support the Global Beamforming future development.

5-3-6 EBM, EBM2 Board (cont'd)

5-3-6-4 B–Mode Output Blocks

The B–mode output block collect vector data and tags for delivery to the Scan Control Board. It can form output vectors from one or multiple input vectors (multi–transmit focus). The vector tags are used to form the control bytes in the output vector. Only complete vectors are sent to the BM_OUTPUT Block. The maximum vector length shall be 512 pixels.

5-3-6-5 M–Mode Output Block

M–mode acquisition is nearly always a multiple firings per output vector operation. When the vector rate is higher than the display rate a peak accumulate function shall be used to provide an output which is the point–by–point peak signal amplitude of all the firings since the last output. The M–mode output block usually outputs one processed M vector after combining the receive vectors from several firings. The maximum ratio of input vectors to output vectors is 256, although this number is transparent to the hardware. M_GATE tag shall control when the current peak accumulation stops, the vector is sent and a new vector is formed. The peak accumulation shall be reset after the data is sent to the BM_OUTPUT Block.

Section 5-4
Back End Processor (BEP 1)

The Back End Processor (BEP 1) receives the data from the Front End Electronics, stores it in memory, performs scan conversion to pixel domain, and drives the system RGB monitor.

Back End Processor software is also providing Color Flow, Doppler, and M-Mode Processing.

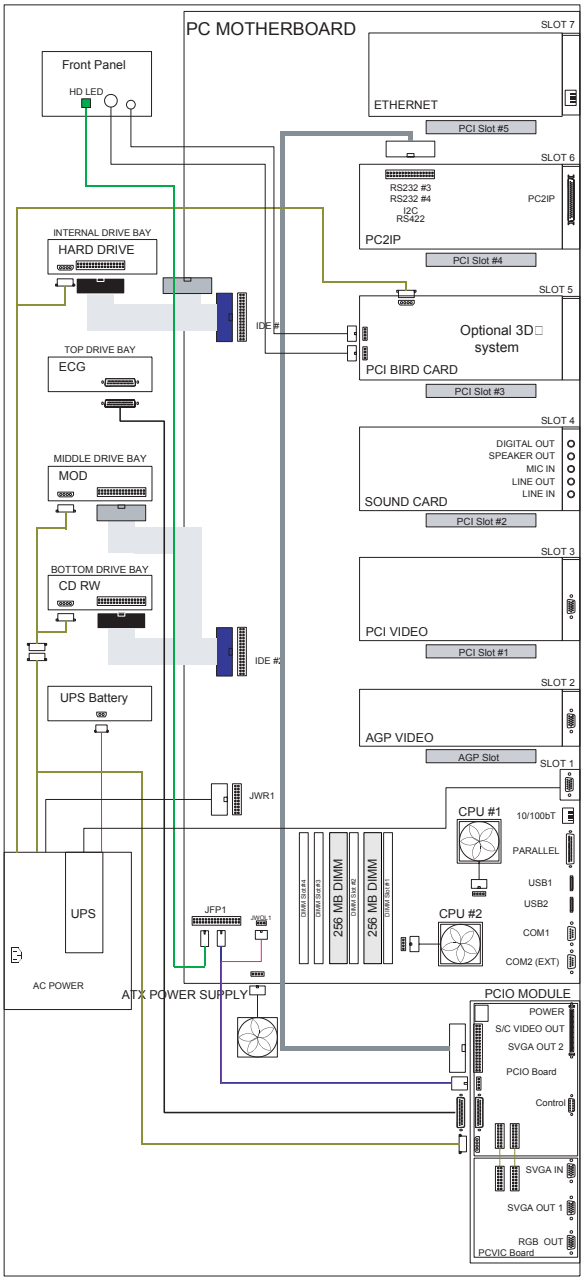


Figure 5-16 CPU/Back End Processor BEP1

NOTE: Specifications mentioned about the Back End Processor (BEP) will be minimum requirements. The actual hardware could exceed these specifications as technology advances.

5-4-1 Enclosure

The EMC enclosure shall house an ATX Power Supply with UPS battery backup, an ATX style motherboard with minimum of 512 MB of RAM and two 733MHz processors

5-4-2 PCI Cards

5 PCI slots on the mother board shall contain the following:

1.) PCI Video Card - Digital Video to the Touch Panel
2.) Sound Card - Sound Blaster Live for audio to speakers
3.) Blank or PCI Bird 3D Card - Option
4.) PC2IP Card - GE designed. PCI Bus interface to the Front End Processor
5.) Network Interface Card - 3Com Ethernet Card

5-4-3 AGP Video Card - SVGA Video to the PCVIC Card

- Analog output shall comply with the SVGA specification.
- Resolution shall be 800x600.
- Support for 32 bit True Color
- Minimum of 8 Mbytes of high speed Video RAM, expandable to at least 16 Mbytes.
- 128-bit internal memory interface.
- Hardware supported asynchronous bit block transfer (80 Mpixels/sec).
- Full Direct 3D and Open-GI support (desirable).

5-4-4 PCIO Board:

This GE designed board does not plug into any slot but is mounted to the inside of the PC chassis.

- Power and Internal PCI control signals

5-4-5 PCI Video Card

- Input from AGP Video card
- SVGA output to the image monitor
- RGB output to color printer

5-4-6 UPS Battery Operation

The UPS batteries provide power to the Back End Processor to enable a controlled shut down of the processor. The UPS batteries will drain slightly when the system is in the off condition. The off condition is defined as:

- Circuit Breaker in the OFF position
- System unplugged from the wall outlet

If the system is left in the OFF condition for an extended period of time (3 to 5 days or more), the system may not boot up or may beep when turned ON. Should this occur, the system needs to recharge the UPS batteries. This could take 15 minutes to as long as 24 hours, depending on the battery age, system input voltage and system temperature.

To eliminate draining the UPS batteries, the system should remain plugged into the wall outlet with the circuit breaker in the ON position.

The expected life of the battery is approximately one (1) year.

5-4-7 Internal Storage Devices:

- A 20 or 40 Gigabyte EIDE Hard Disk Drive (HDD) inside the Back End Processor cabinet.
- 3.5 inch Magneto-Optical Drive (MOD) (available from front of scanner).
- CD-RW Drive (available from front of scanner).

5-4-8 Location of the Back End Processor

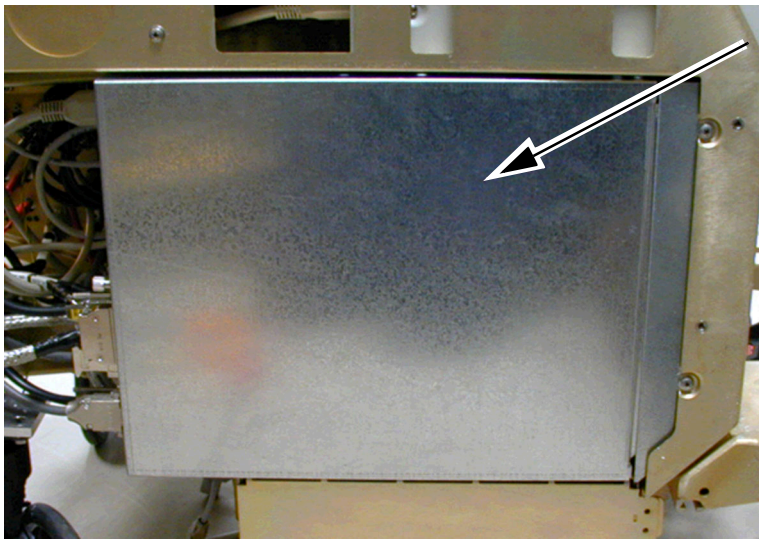

P3 Backend Processor
P4 Backend Processors typically have a fan in the center of the cover
Left Side of Scanner
Front of Scanner

Figure 5-17 Backend Processor 1 mounted in scanner

5-4-9 Inputs (BEP 1)

5-4-9-1 AC Power

Table 5-5 AC Power

Input	Description	Connection from:
230 VAC	AC Power	AC Distribution Box > Backend Processor

5-4-9-2 DC Voltages

Table 5-6 DC Input Voltages

Input	Description	Connected to:
+5Vstb	Standby voltage	DC Power Supply via Backplane
GND	Electrical Ground	DC Power Supply via Backplane and II/O

5-4-9-3 Input Signals

Table 5-7 Input Signals

Signal Name	Description	Signal Path
PWR_OK*	Power verification signal from Card Rack	Card Rack > IIO > PC2IO
ON/OFF Switch	Signal from the ON/OFF switch on the Control Panel and from the Reset button on the rear of the External I/O.	Top Console > IIO > PC2IO ON/OFF Reset (EIO) > IIO > PC2IO
I2C Register Interrupt	Interrupt signal from I2C Bus	EIO > IIO > PC2IO
Microphone in to BEP	Microphone signal from Monitor (Top Console)	Top Console > IIO > BEP
Audio in to BEP	Audio from VCR or Doppler Audio	Replay Audio from VCR > IIO > BEP Doppler Audio Out from Card Rack > IIO > BEP

5-4-9-4 Bi-directional Signals

Table 5-8 Bi-directional Signals

Signal Name	Description	Signal Path
UPS Control RS232	Control Signals to and from the UPS	BEP > IIO
RS232 XDCTRL	Not Used	PC2IO > IIO > Not Used
I2C Bus	Data bus used for Remote Control of External Units and for reading module versions.	PC2IO > IIO > EIO
Spare RS232	Not Used	PC2IO > IIO > Not Used
VCR Remote Ctrl (RS232)	Control signal to Internal VCR	PC2IO > IIO > VCR
USB #1	USB bus to Top Console	PC2IO > IIO > Top Console
COM 1	Can be configured to transfer report page data	PC2IO > IIO > EIO
COM 2	Modem	PC2IO > IIO > EIO (Rear of Module) > Modem

Table 5-8 Bi-directional Signals

Signal Name	Description	Signal Path
Ethernet	Standard TCP/IP Ethernet	BEP > IIO > EIO > External Network
USB #2	USB Bus for External Units	BEP > IIO > EIO > External USB Unit

5-4-10 Outputs

Table 5-9 Output Signals

Signal Name	Description	Signal Path
+5VDC	DC Voltage	PC2IO > IIO
+12VDC	DC Voltage	PC2IO > IIO
PS_ON*	TBD (Active Low)	PC2IO > IIO > Card Rack
Standby	TBD	PC2IO > IIO > Top Console
SVideo	SVideo Out	PCVIC > PC2IO > IIO > EIO
CVideo	Composite Color Video	PCVIC > PC2IO > IIO > EIO
VGA	VGA High Resolution Video to External Video Screen	PCVIC > PC2IO > IIO > EIO
VGA	VGA High Resolution Video to Internal Video Screen (Top Console)	BEP > Top Console
BW Video RGB	BW Video from RGB. This signal is not used on LOGIQ™ 9	PCVIC > PC2IO > IIO > EIO This signal is not used on LOGIQ™ 9
Audio Out	Audio Out from BEP	BEP > IIO > Internal VCR BEP > IIO > EIO > External VCR
TRIG	Video Trig Signal	PC2IO > IIO > EIO

Section 5-5
Back End Processor (BEP 2)

The Back End Processor (BEP 2) receives the data from the Front End Electronics, stores it in memory, performs scan conversion to pixel domain, and drives the system RGB monitor.

Back End Processor software is also providing Color Flow, Doppler, and M-Mode Processing.

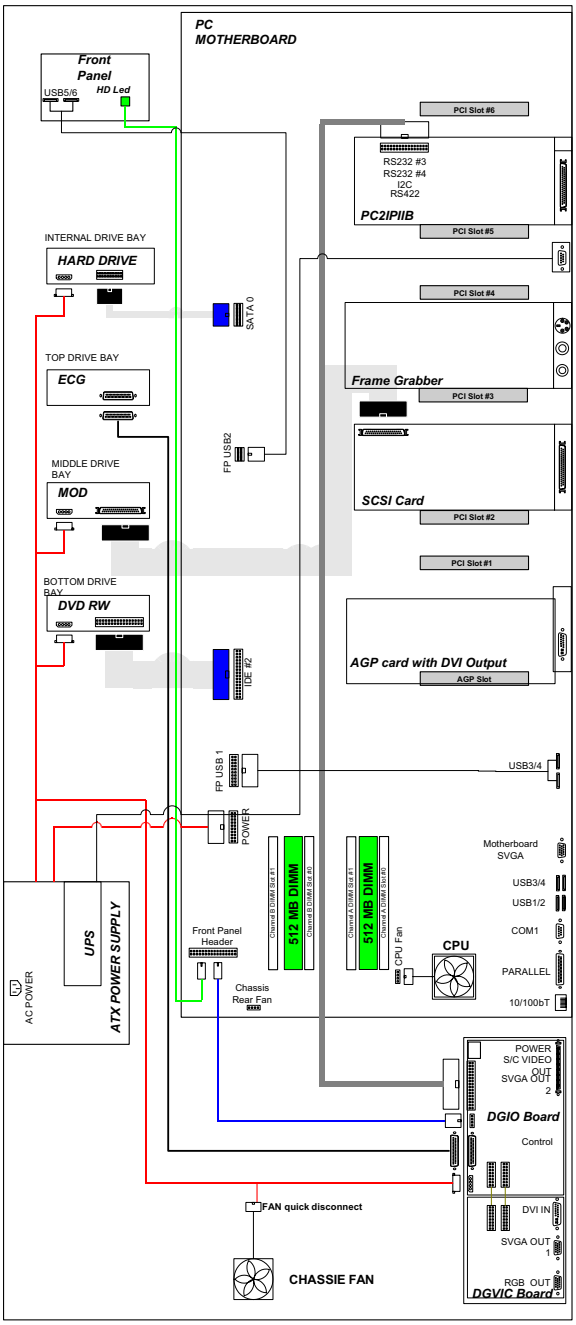


Figure 5-18 CPU/Back End Processor BEP2

NOTE: Specifications mentioned about the Back End Processor (BEP) will be minimum requirements. The actual hardware could exceed these specifications as technology advances.

5-5-1 Enclosure

The EMC enclosure shall house an ATX Power Supply with UPS battery backup, an ATX style motherboard with minimum of 512 MB of RAM and one 2GHz processor.

5-5-2 PCI Cards

6 PCI slots on the mother board shall contain the following:

1.) Sound Card - Sound Blaster Live for audio to speakers
2.) Blank or FOB
3.) PCI Video Card - Digital Video to the Touch Panel
4.) USB Control
5.) PC2IP Card - GE designed. PCI Bus interface to the Front End Processor
6.) Blank or CW option

5-5-3 AGP Video Card - DVI Video to the DGVIC

- Analog output shall comply with the SVGA specification.
- Resolution shall be 800x600.
- Support for 32 bit True Color
- Minimum of 8 Mbytes of high speed Video RAM, expandable to at least 16 Mbytes.
- 128-bit internal memory interface.
- Hardware supported asynchronous bit block transfer (80 Mpixels/sec).
- Full Direct 3D and Open-GI support (desirable).

5-5-4 PCIO Board:

This GE designed board does not plug into any slot but is mounted to the inside of the PC chassis.

- Power and Internal PCI control signals

5-5-5 PCVIC Card

- Input from Motherboard AGP Video (BEP 2.0)

This GE designed board does not plug into any slot but is mounted to the inside of the PC chassis.

- SVGA output to the image monitor
- RGB output to color printer

5-5-6 DGVIC, DGIO and ADD Cards BEP 2.1 (BT'02, November 2002)

The ADD Card is a PCI card that mimics the AGP video and provides a digital video output to the DGVIC board.

The DGVIC converts the digital video to RGBS, SVGA (to Monitor and External I/O), S-video and Composite video outputs.

The DGIO provides signals and power to I/O boards. Signals like PS_ON, I^2C, RS232, PC Power and PC On/Off.

5-5-7 Additional Memory (RAM) (BT'03, October 2003) - BEP2.2

Additional memory was added to the motherboard for R3.0.0 Software and BT'03. One of the 256 MByte SIMM modules was replaced with a 512 MByte module. This brings the total RAM memory to 768MBytes and designated the unit to be a BEP2.2.

5-5-8 DGVIC/DGIO Upgrade

It is possible that older P3 Back End Processor video chains could be upgraded to digital. This involves replacing the Analog AGP Video card with a Matrox video card that has analog and video outputs.

The PC2IO/PCVIC Tray assembly is also replaced with the DGIO/DGVIC Tray.

Digital video is supplied by the Matrox video card to the DGVIC for distribution to peripherals. Monitor video is taken directly from the Analog output of the Matrox video card instead of the DGVIC.

5-5-9 UPS Battery Operation

The UPS batteries provide power to the Back End Processor to enable a controlled shut down of the processor. The UPS batteries will drain slightly when the system is in the off condition. The off condition is defined as:

- Circuit Breaker in the OFF position
- System unplugged from the wall outlet

If the system is left in the OFF condition for an extended period of time (3 to 5 days or more), the system may not boot up or may beep when turned ON. Should this occur, the system needs to recharge the UPS batteries. This could take 15 minutes to as long as 24 hours, depending on the battery age, system input voltage and system temperature.

To eliminate draining the UPS batteries, the system should remain plugged into the wall outlet with the circuit breaker in the ON position.

The expected life of the battery is approximately one (1) year.

5-5-10 Internal Storage Devices:

- A 40 Gigabyte EIDE Hard Disk Drive (HDD) inside the Back End Processor cabinet.
- 3.5 inch Magneto-Optical Drive (MOD) (available from front of scanner).
- CD-RW Drive (available from front of scanner).

5-5-11 Location of the Back End Processor

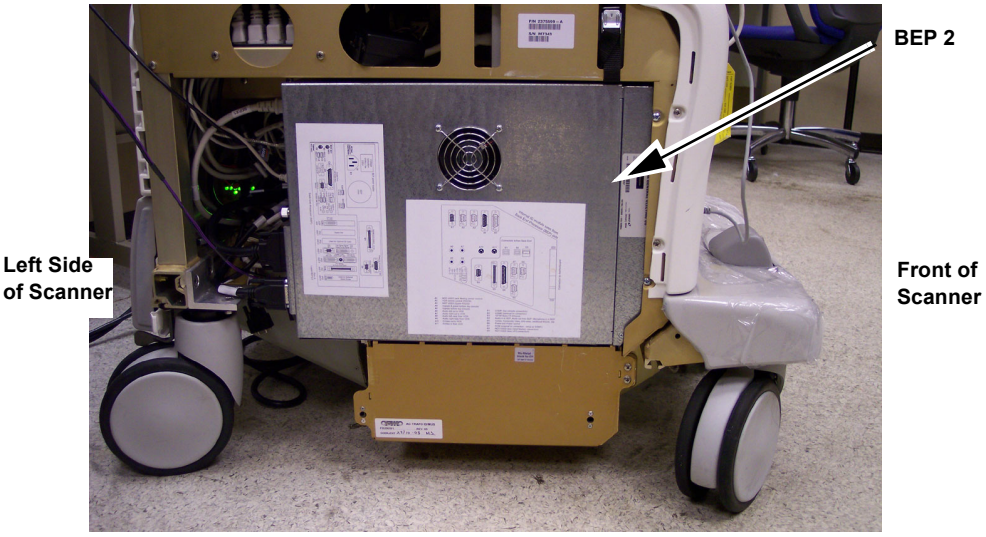


Figure 5-19 Backend Processor 2 mounted in scanner

5-5-12 Inputs

5-5-12-1 AC Power

Table 5-10 AC Power

Input	Description	Connection from:
230 VAC	AC Power	AC Distribution Box > Backend Processor

5-5-12-2 DC Voltages

Table 5-11 DC Input Voltages

Input	Description	Connected to:
+5Vstb	Standby voltage	DC Power Supply via Backplane
GND	Electrical Ground	DC Power Supply via Backplane and II/O

5-5-12 Inputs (cont'd)

5-5-12-3 Input Signals

Table 5-12 Input Signals

Signal Name	Description	Signal Path
PWR_OK*	Power verification signal from Card Rack	Card Rack > IIO > PC2IO
ON/OFF Switch	Signal from the ON/OFF switch on the Control Panel and from the Reset button on the rear of the External I/O.	Top Console > IIO > PC2IO ON/OFF Reset (EIO) > IIO > PC2IO
I2C Register Interrupt	Interrupt signal from I2C Bus	EIO > IIO > PC2IO
Microphone in to BEP	Microphone signal from Monitor (Top Console)	Top Console > IIO > BEP
Audio in to BEP	Audio from VCR or Doppler Audio	Replay Audio from VCR > IIO > BEP Doppler Audio Out from Card Rack > IIO > BEP

5-5-12-4 Bi-directional Signals

Table 5-13 Bi-directional Signals

Signal Name	Description	Signal Path
UPS Control RS232	Control Signals to and from the UPS	BEP > IIO
RS232 XDCTRL	Not Used	PC2IO > IIO > Not Used
I2C Bus	Data bus used for Remote Control of External Units and for reading module versions.	PC2IO > IIO > EIO
Spare RS232	Not Used	PC2IO > IIO > Not Used
VCR Remote Ctrl (RS232)	Control signal to Internal VCR	PC2IO > IIO > VCR
USB #1	USB bus to Top Console	PC2IO > IIO > Top Console
COM 1	Can be configured to transfer report page data	PC2IO > IIO > EIO
COM 2	Modem	PC2IO > IIO > EIO (Rear of Module) > Modem
Ethernet	Standard TCP/IP Ethernet	BEP > IIO > EIO > External Network
USB #2	USB Bus for External Units	BEP > IIO > EIO > External USB Unit

NOTE: BEP2.x processors have one Com Port and six USB Ports. The Com Port is connected to the modem via the Internal I/O. A USB to Serial Converter feeds the external serial connection via the Internal I/O. BEP 2.1 Processors have digital video coming from a Matrox or ADD card going to the DGIO/DGVIC Tray. BEP 2.x processors have Ethernet and Analog Video on the motherboard.

5-5-12-5 USB to Serial Adapter Cable Setup (RS232 Serial Port Connector on the External I/O)

The Prolific USB to RS232 Adapter Cable (black one) should be properly set up when the Base Image Load is applied to the system. However, if you need to set a specific parameter for the USB COM Port (COM1) perform the following steps:

- After booting up with the Service Key (Dongle), entering Maintenance Mode and Windows, select My Computer>Properties>Hardware Tab>Device manager.
- Under Ports (COM & LPT) select “Prolific USB-to-Serial Comm/Port (COM 3)” and select Properties.
- Under the Port Settings TAB you can set the Bits per second, Data bits, Parity Stop Bits and Flow Control to the desired values.

Table 5-14 Factory Default Values

Signal Name	Setting
Bits Per Second	9600
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

5-5-13 Outputs

Table 5-15 Output Signals

Signal Name	Description	Signal Path
+5VDC	DC Voltage	DG2IO > IIO
+12VDC	DC Voltage	DG2IO > IIO
PS_ON*	TBD (Active Low)	DG2IO > IIO > Card Rack
Standby	TBD	DG2IO > IIO > Top Console
SVideo	SVideo Out	DGVIC > DG2IO > IIO > EIO
CVideo	Composite Color Video	DGVIC > DG2IO > IIO > EIO
VGA	VGA High Resolution Video to External Video Screen	DGVIC > DG2IO > IIO > EIO
VGA	VGA High Resolution Video to Internal Video Screen (Top Console)	BEP > Top Console
BW Video RGB	BW Video from RGB. This signal is not used on LOGIQ™ 9	DGVIC > DG2IO > IIO > EIO This signal is not used on LOGIQ™ 9
Audio Out	Audio Out from BEP	BEP > IIO > Internal VCR BEP > IIO > EIO > External VCR
TRIG	Video Trig Signal	PC2IO > IIO > EIO

Section 5-6
Back End Processor (BEP 3)

The Back End Processor (BEP 3) receives the data from the Front End Electronics, stores it in memory, performs scan conversion to pixel domain, and drives the system RGB monitor.

Back End Processor software is also providing Color Flow, Doppler, and M-Mode Processing.

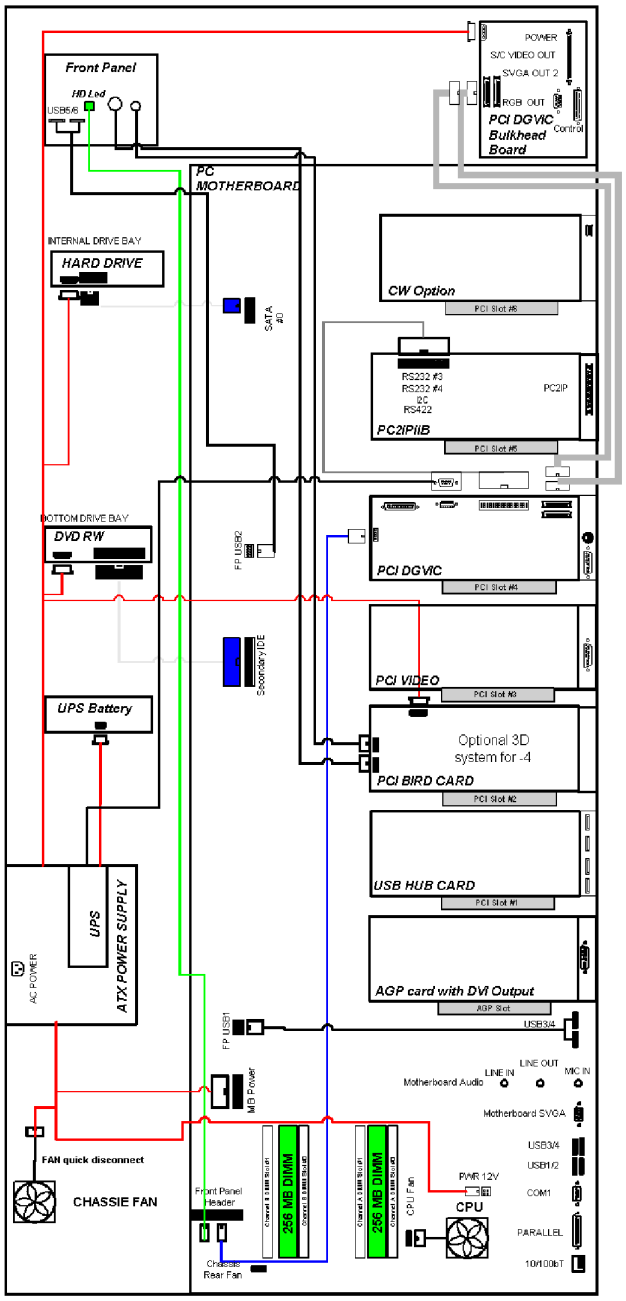


Figure 5-20 CPU/Back End Processor BEP3

NOTE: Specifications mentioned about the Back End Processor (BEP) will be minimum requirements. The actual hardware could exceed these specifications as technology advances.

5-6-1 Enclosure

The EMC enclosure shall house an ATX Power Supply with UPS battery backup, an ATX style motherboard with minimum of 512 MB of RAM and a 3.2 GHz processor.

5-6-2 PCI Cards

6 PCI slots on the mother board shall contain the following:

1.) USB 2.0 Hub Card
2.) Blank or PCI Bird Card
3.) PCI Video Card
4.) PCI DGVIC Card
5.) PC2IP Card
6.) Blank or CW Card

5-6-3 AGP Video Card - DVI Video to the DGVIC Card

- Analog output shall comply with the SVGA specification.
- Resolution shall be 800x600.
- Support for 32 bit True Color
- Minimum of 8 Mbytes of high speed Video RAM, expandable to at least 16 Mbytes.
- 128-bit internal memory interface.
- Hardware supported asynchronous bit block transfer (80 Mpixels/sec).
- Full Direct 3D and Open-GI support (desirable).

5-6-4 PCI DGVIC and ADD Cards

The ADD Card is a PCI card that mimics the AGP video and provides a digital video output to the PCI DGVIC board.

The PCI DGVIC converts the digital video to SVGA (to External I/O), S-video and Composite video outputs. It also provides signals and power to I/O boards. Signals like PS_ON, I^2C, RS232, PC Power and PC On/Off.

5-6-5 UPS Battery Operation

The UPS batteries provide power to the Back End Processor to enable a controlled shut down of the processor. The UPS batteries will drain slightly when the system is in the off condition. The off condition is defined as:

- Circuit Breaker in the OFF position
- System unplugged from the wall outlet

If the system is left in the OFF condition for an extended period of time (3 to 5 days or more), the system may not boot up or may beep when turned ON. Should this occur, the system needs to recharge the UPS batteries. This could take 15 minutes to as long as 24 hours, depending on the battery age, system input voltage and system temperature.

To eliminate draining the UPS batteries, the system should remain plugged into the wall outlet with the circuit breaker in the ON position.

The expected life of the battery is approximately one (1) year.

5-6-6 Internal Storage Devices:

- A 80 Gigabyte EIDE Hard Disk Drive (HDD) inside the Back End Processor cabinet.
- DVD Drive (available from front of scanner).

5-6-7 Location of the Back End Processor

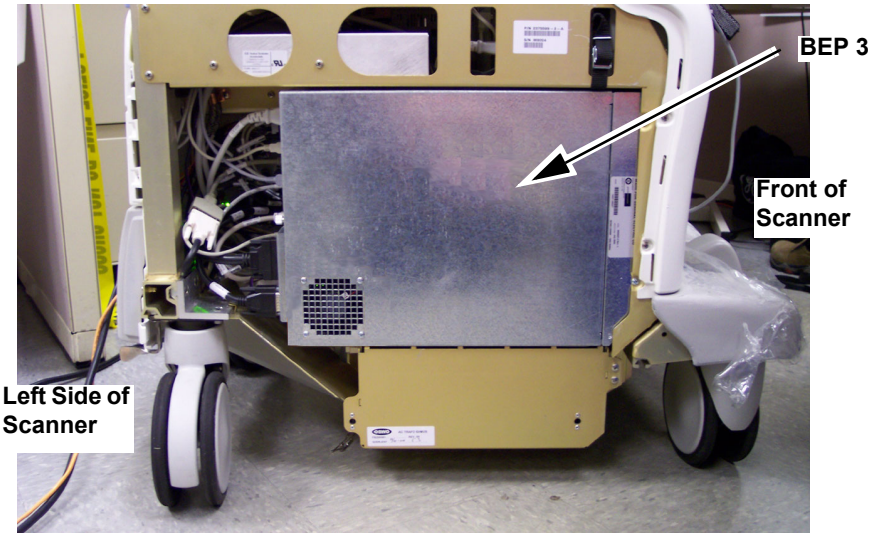


Figure 5-21 Backend Processor mounted in scanner

5-6-8 Inputs (BEP 3)

5-6-8-1 AC Power

Table 5-16 AC Power

Input	Description	Connection from:
230 VAC	AC Power	AC Distribution Box > Backend Processor

5-6-8-2 DC Voltages

Table 5-17 DC Input Voltages

Input	Description	Connected to:
+5Vstb	Standby voltage	DC Power Supply via Backplane
GND	Electrical Ground	DC Power Supply via Backplane and II/O

5-6-8 Inputs (BEP 3) (cont'd)

5-6-8-3 Input Signals

Table 5-18 Input Signals

Signal Name	Description	Signal Path
PWR_OK*	Power verification signal from Card Rack	Card Rack > IIO > PC2IO
ON/OFF Switch	Signal from the ON/OFF switch on the Control Panel and from the Reset button on the rear of the External I/O.	Top Console > IIO > PC2IO ON/OFF Reset (EIO) > IIO > PC2IO
I2C Register Interrupt	Interrupt signal from I2C Bus	EIO > IIO > PC2IO
Audio in to BEP	Audio from VCR or Doppler Audio	Replay Audio from VCR > IIO > BEP Doppler Audio Out from Card Rack > IIO > BEP

5-6-8-4 Bi-directional Signals

Table 5-19 Bi-directional Signals

Signal Name	Description	Signal Path
UPS Control RS232	Control Signals to and from the UPS	BEP > IIO
I2C Bus	Data bus used for Remote Control of External Units and for reading module versions.	PC2IO > IIO > EIO
VCR Remote Ctrl (RS232)	Control signal to Internal VCR	PC2IO > IIO > VCR
USB #1	USB bus to Top Console	PC2IO > IIO > Top Console
COM 1	Can be configured to transfer report page data	PC2IO > IIO > EIO
COM 2	Modem	PC2IO > IIO > EIO (Rear of Module) > Modem
Ethernet	Standard TCP/IP Ethernet	BEP > IIO > EIO > External Network
USB #2	USB Bus for External Units	BEP > IIO > EIO > External USB Unit

NOTE: BEP3 processors have one Com Port and 12 USB Ports. The Com Port is connected to the Internal I/O. BEP 3 Processors have digital video coming from a Matrox or ADD card going to the DGIO/DGVIC or PCI DGVIC Tray. BEP 3 processors have Ethernet and Analog Video on the motherboard.

5-6-9 Outputs

Table 5-20 Output Signals

Signal Name	Description	Signal Path
+5VDC	DC Voltage	Bulkhead > IIO
+12VDC	DC Voltage	Bulkhead > IIO
PS_ON*	TBD (Active Low)	PCI-DGVIC > Bulkhead > IIO > Card Rack
Standby	TBD	PCI-DGVIC > Bulkhead > IIO > Top Console
SVideo	SVideo Out	PCI-DGVIC > Bulkhead > IIO > EIO
CVideo	Composite Color Video	PCI-DGVIC > Bulkhead > IIO > EIO
VGA	VGA High Resolution Video to External Video Screen	PCI-DGVIC > Bulkhead > IIO > EIO
VGA	VGA High Resolution Video to Internal Video Screen (Top Console)	BEP > Top Console
BW Video RGB	BW Video from RGB. This signal is not used on LOGIQ™ 9	PCI-DGVIC > Bulkhead > IIO > EIO This signal is not used on LOGIQ™ 9
Audio Out	Audio Out from BEP	BEP > IIO > Internal VCR BEP > IIO > EIO > External VCR
TRIG	Video Trig Signal	PCI-DGVIC > Bulkhead > IIO > EIO

Section 5-7
BEP Power On Path

(refer to Figure 5-22 on page 5-36)

The Back End Processor is powered ON by:

- Press and release the OP I/O Standby (On/Off) switch.
- The signal from the OP I/O goes to the II/O (A4) and through the rack power relay in the Internal I/O.
- The PC Power ON signal from the II/O (B6) goes to the PC2IO (D2) then to the BEP motherboard commanding the BEP Power Supply to turn ON.

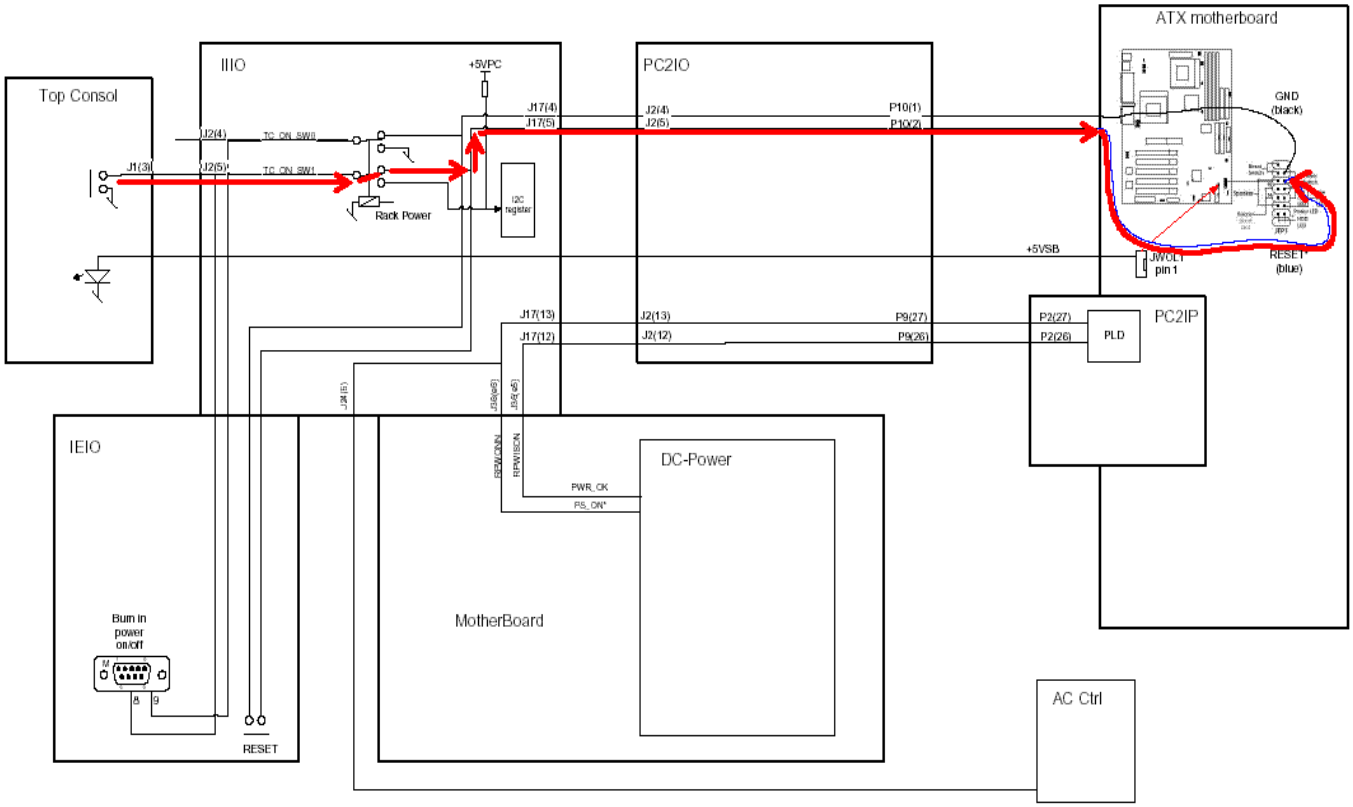


Figure 5-22 BEP Power On Path

Section 5-8
BEP Power Off Path

(refer to Figure 5-23 on page 5-37)

The Back End Processor is powered Off by:

- Press and release the OP I/O Standby (On/Off) switch.
- The signal from the OP I/O goes to the II/O (A4) and through the rack power relay in the Internal I/O to the I^2C register.
- Software detects the request to power down via the I^2C buss from the II/O (B5) to the BEP (D1).
- The system begins a controlled shut down procedure closing applications, files, turning off FE rack power and finally BEP power.

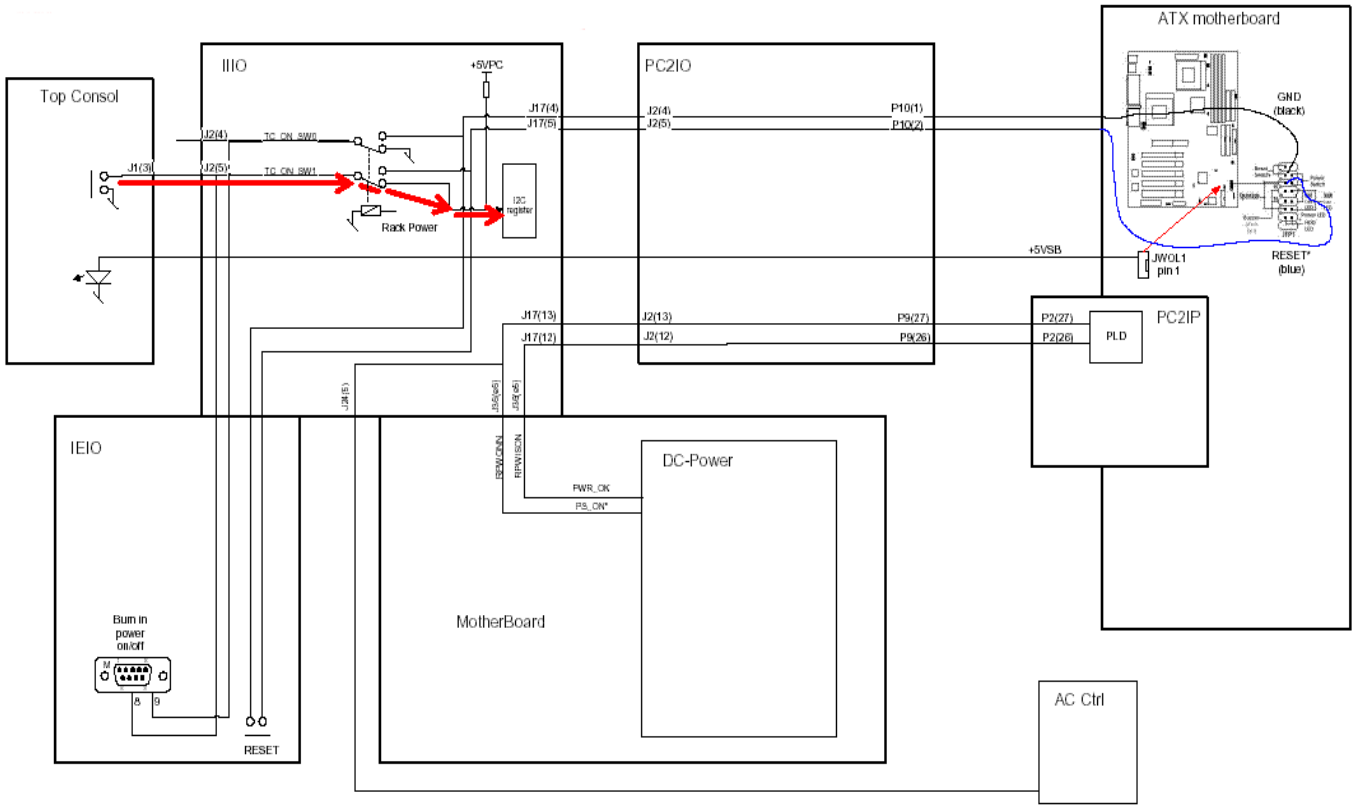


Figure 5-23 BEP Power Off Path

Section 5-9
Operator Console Control PWA

Figure 5-25 and Figure 5-24 show the audio path through the Operator Console Control Printed Wire Assembly.

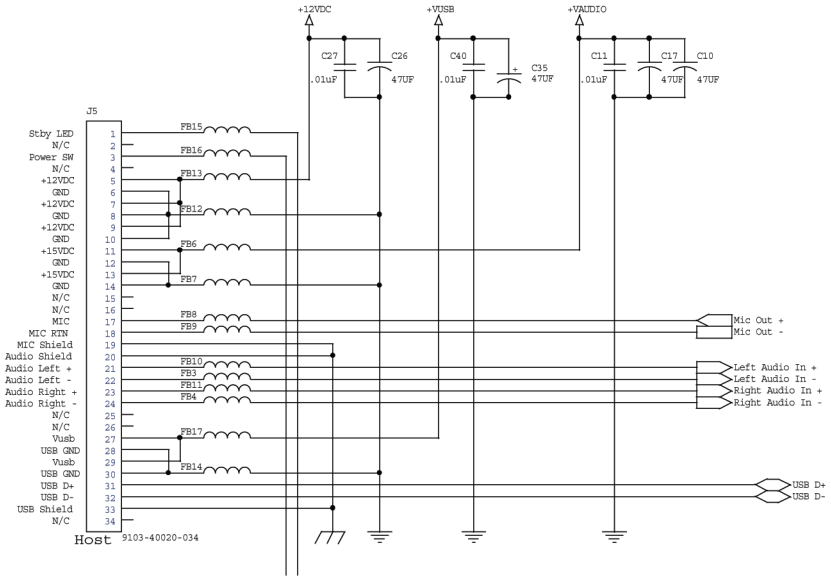


Figure 5-24 USB-OP Console Control PWA - Power

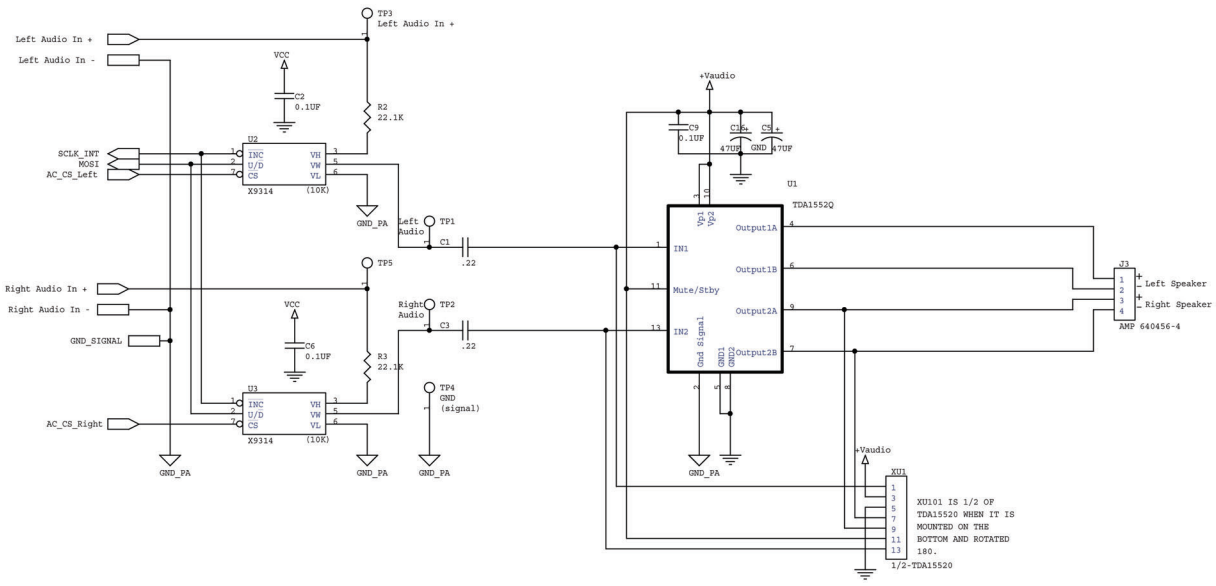


Figure 5-25 USB-OP Console Control PWA - Audio

5-9-1 Console Main Cable

5-9-1-1 Main Cable Connector Functions - Prior to BT04

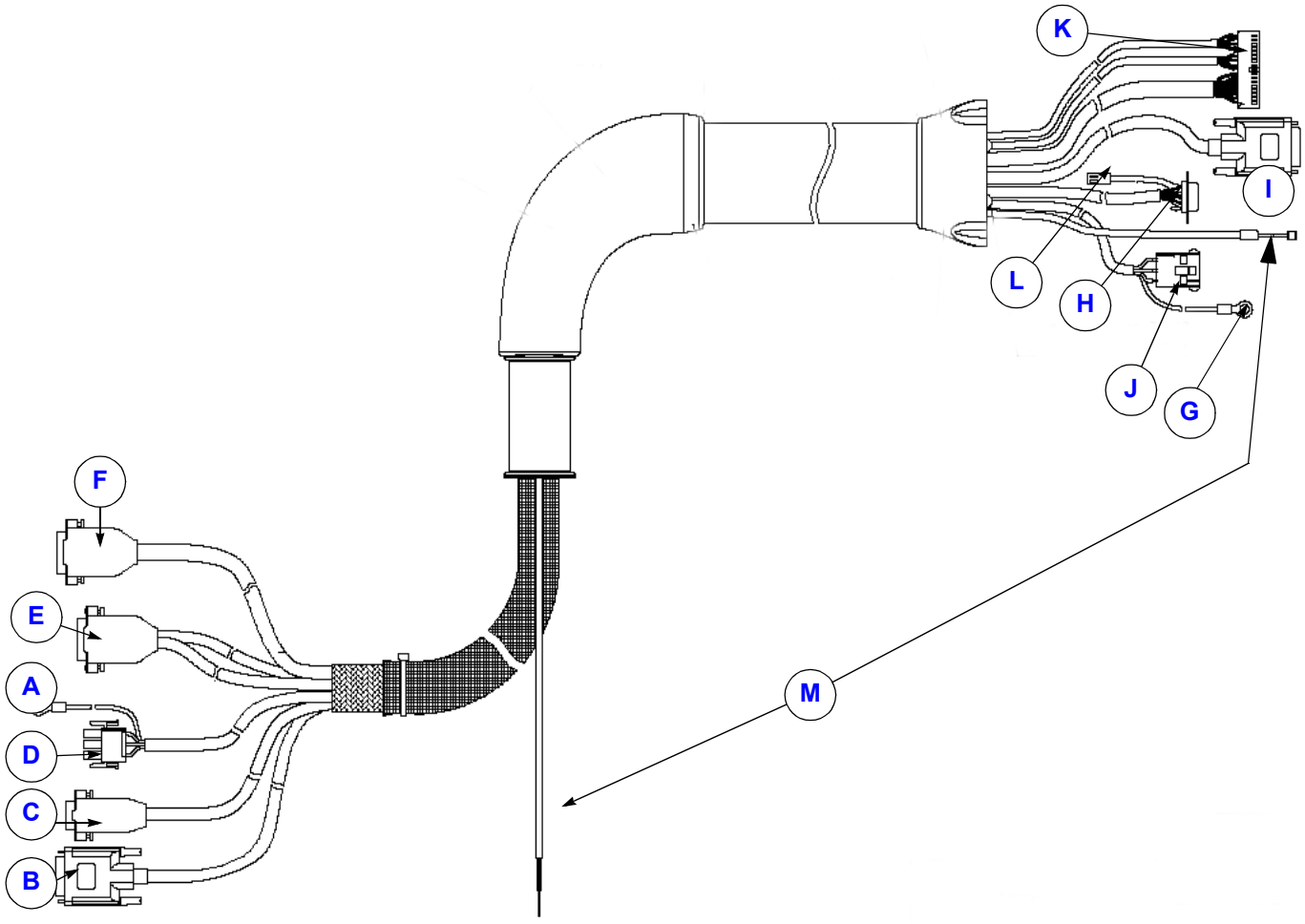


Figure 5-26 Main Cable Drawing prior to BT04

Table 5-21 Main Cable Composition Prior to BT04

Item	Function	Lower to	Description		
A	Safety Ground Connector	A - G	Safety Ground Connector		
B	DVI to DVI Interface	B - I	Interface to the Touch Screen B- I		
C	RGB to the Main Monitor	C - H	RGB to the Main Monitor C - H		
D	110 VAC to the Main Monitor	D - J	110 VAC to the Main Monitor D - J		
E	USB Audio, Microphone	E - K	USB Audio, Microphone and DC for Operator Panel		
F	DC Power and Control	F - K	DC Power and Control to the Operator panel		
G	Safety Ground Connector	A - G	Safety Ground Connector		
H	RGB to the Main Monitor	C- H	RGB to the Main Monitor C - H		
I	DVI to DVI Interface	B - I	Interface to the Touch Screen B - I		

Table 5-21 Main Cable Composition Prior to BT04

Item	Function	Lower to	Description		
J	110 VAC to the Main Monitor	D - J	110 VAC to the Main Monitor D - J		
K	USB Audio, Microphone and DC	E/F - K	USB Audio, Microphone and DC for Operator Panel		
L	Microphone to the Operator panel	E - L	to the Operator panel Microphone		
M	"Z" Release Cable		From piston to "Z" release handle on the console		

5-9-1-2 Main Cable Connectors with Pinouts - Prior to BT04

Table 5-22 Connector A & G- Safety Ground

Pin	Signal
1	Ground

Table 5-23 Connector B & I - Touch Screen Interface

Pin	Signal	Pin	Signal	Pin	Signal
1	LVDS Data 2-	10	LVDS Data 1+	19	Ground
2	LVDS Data 2+	11	Ground	20	
3	Ground	12		21	
4		13		22	Ground
5		14	+5V	23	LVDS Clock -
6	+5V	15	Return	24	LVDS Clock +
7	Return	16	+12V Backlight		
8		17	LVDS Data 2-		
9	LVDS Data 1-	18	LVDS Data 2-		

Table 5-24 Connector C & H - Touch Screen Interface

Pin	Signal	Pin	Signal	Pin	Signal
1	Red	6	Red Ground	11	nc
2	Green	7	Green Ground	12	nc
3	Blue	8	Blue Ground	13	H Sync
4	nc	9	nc	14	V Sync
5	nc	10	Sync Ground	15	nc

Table 5-25 Connector D & J - 110VAC to Monitor

Pin	Signal	Pin	Signal	Pin	Signal
1	110 VAC	2	Ground	3	Neutral

Table 5-26 Connector E - USB, Audio & Microphone

Pin	Signal	Pin	Signal	Pin	Signal
1	nc	6	USB 5V	11	Ground Audio - Right
2	nc	7	USB 5V	12	Ground Microphone
3	Audio - Left	8	USB D+	13	Ground USB
4	Audio - Right	9	nc	14	Ground USB
5	Microphone	10	Ground Audio - Left	15	USB D-

Table 5-27 Connector F - Op Console Power

Pin	Signal	Pin	Signal	Pin	Signal
1	+15	6	+12V	11	Standby LED 0
2	+15	7	+12V	12	nc
3	nc	8	+12v	13	+12 Ground
4	On/Off SW0	9	+15 Ground	14	Ground USB
5	On/Off SW1	10	+15 Ground	15	USB D-

Table 5-28 Connector K- Op Console Power, Audio, Mic, Control

Pin	Signal	Pin	Signal	Pin	Signal
1	Standby LED 0	13	+15V	25	nc
2	nc	14	+ 15V Ground	26	nc
3	On/Off SW1	15	nc	27	USB 5V
4	On/Off SW0	16	nc	28	USB Ground
5	+12V	17	MIcrophone	29	USB 5V
6	+12V Ground	18	Microphone Ground	30	USB Ground
7	+12V	19	Shield Power/Control	31	USB D+
8	+12V Ground	20	Shield Audio/Mic	32	USB D-
9	+12V	21	Audio - Left	33	Shield USB
10	+12V Ground	22	Audio - Left Ground	34	nc
11	+15V	23	Audio - Right		
12	+ 15V Ground	24	Audio - Right Ground		

Table 5-29 Connector L- Console Microphone

Pin	Signal
1	Microphone
	Microphone Ground

5-9-1-3 Main Cable Connector Functions - For BT04

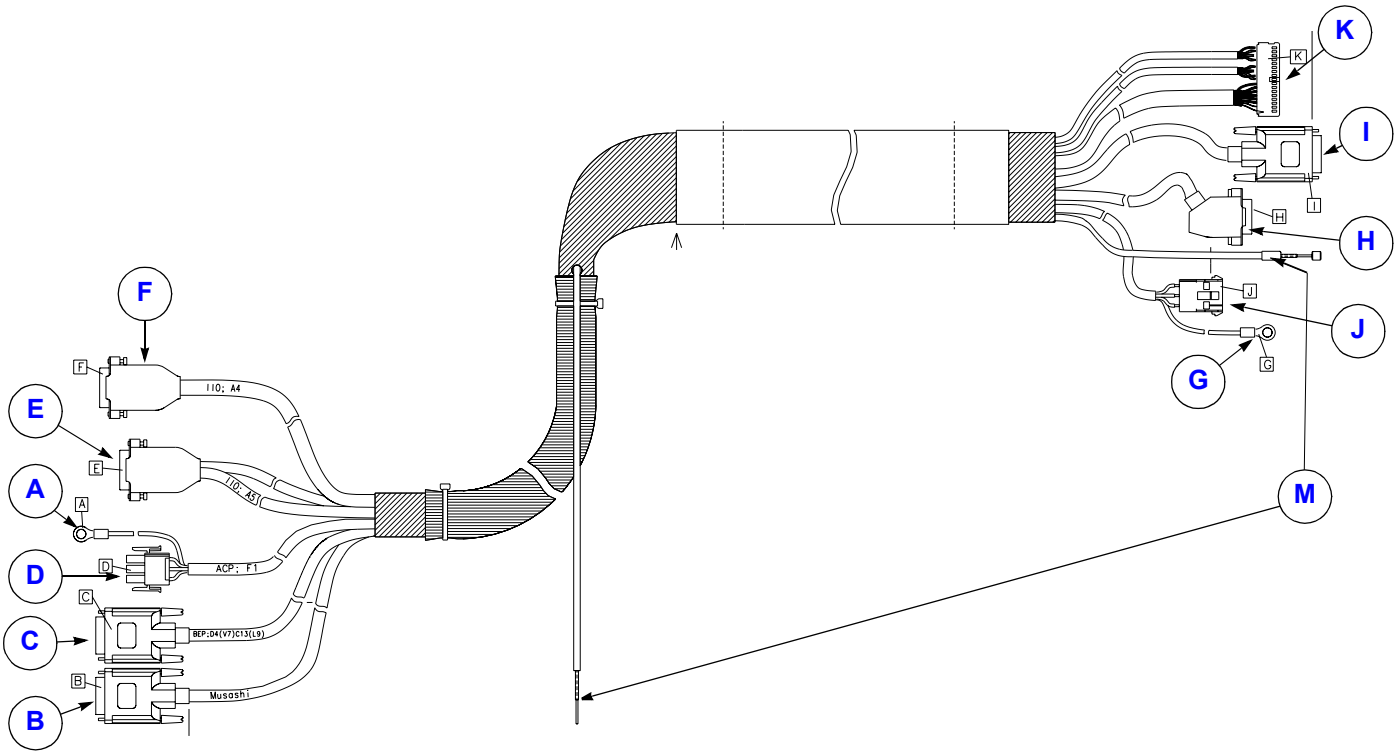


Figure 5-27 Main Cable for BT04

Table 5-30 Main Cable Composition For BT04

Item	Function	Lower to	Description
A	Safety Ground Connector	A & G	Safety Ground Connector
B	DVI to DVI Interface	B & I	Interface to the Touch Screen B- I
C	Housing Terminals	C & H	Video for Main CRT
D	110 VAC to the Main Monitor	D & J	110 VAC to the Main Monitor D - J
E	USB Audio, Microphone	E - K	USB Audio, Microphone and DC for Operator Panel
F	DC Power and Control	F - K	DC Power and Control to the Operator panel
G	Safety Ground Connector	A & G	Safety Ground Connector
H	RGB to the Main Monitor	C & H	RGB to the Main Monitor C - H
I	DVI to DVI Interface	B & I	Interface to the Touch Screen B - I
J	110 VAC to the Main Monitor	D & J	110 VAC to the Main Monitor D - J
K	USB Audio, Microphone and DC	E/F - K	USB Audio, Microphone and DC for Operator Panel
M	“Z” Release Cable		From piston to “Z” release handle on the console

5-9-1-4 Main Cable Connectors with Pinouts - For BT04 (5119218)

Table 5-31 Connector A & G- Safety Ground - For BT04 (5119218)

Pin	Signal
1	Ground

Table 5-32 Connector B & I - Touch Screen Interface - For BT04 (5119218)

Pin	Signal	Pin	Signal	Pin	Signal
1	LVDS Data 2-	10	LVDS Data 1+	19	Ground
2	LVDS Data 2+	11	Ground	20	
3	Ground	12		21	
4		13		22	Ground
5		14	+5V	23	LVDS Clock -
6	+5V	15	Return	24	LVDS Clock +
7	Return	16	+12V Backlight		
8		17	LVDS Data 0-		
9	LVDS Data 1-	18	LVDS Data 0+		

Table 5-33 Connector C & H - Video for Main CRT - For BT04 (5119218)

Pin	Signal	Pin	Signal	Pin	Signal
1	TMDS Data 2-	10	TMDS Data 1+	19	Ground
2	TMDS Data 2+	11	Ground	20	nc
3	Ground	12	nc	21	nc
4	nc	13	nc	22	Ground
5	nc	14	+5V	23	TMDS Clock -
6	DDC Clock (SCL)	15	+5 Return	24	TMDS Clock +
7	DDC Data (SCA)	16	Hot Plug Detect	C1	Analog Red
8	Analog Vert Sync	17	TMDS Data 0-	C2	Analog Green
9	TMDS Data 1-	18	TMDS Data 0+	C3	Analog Blue
				C4	Analog Horz Sync
				C5	Ground

Table 5-34 Connector D & J - 110VAC to Monitor - For BT04 (5119218)

Pin	Signal	Pin	Signal	Pin	Signal
1	110 VAC	2	Ground	3	Neutral

Table 5-35 Connector E - USB, Audio & Microphone - For BT04 (5119218)

Pin	Signal	Pin	Signal	Pin	Signal
1	nc	6	USB 5V	11	Ground Audio - Right
2	nc	7	USB 5V	12	Ground Microphone
3	Audio - Left	8	USB D+	13	Ground USB
4	Audio - Right	9	nc	14	Ground USB
5	Microphone	10	Ground Audio - Left	15	USB D-

Table 5-36 Connector F - Op Console Power - For BT04 (5119218)

Pin	Signal	Pin	Signal	Pin	Signal
1	+15	6	+12V	11	Standby LED 0
2	+15	7	+12V	12	nc
3	nc	8	+12v	13	+12 Ground
4	On/Off SW0	9	+15 Ground	14	+12 Ground
5	On/Off SW1	10	+15 Ground	15	+12 Ground

Section 5-10
Patient I/O (Currently not supported by the LOGIQ™ 9)

The Patient I/O is mounted inside the Backend Processor's cabinet with its connector panel available on the front of the scanner.

The Patient IO contains the electronics for ECG, phono and two analog inputs. One of the inputs has programmable gain. The module extracts respiration from ECG. The electronics also contains a pacemaker detector. The four inputs are separately isolated because of safety requirements.

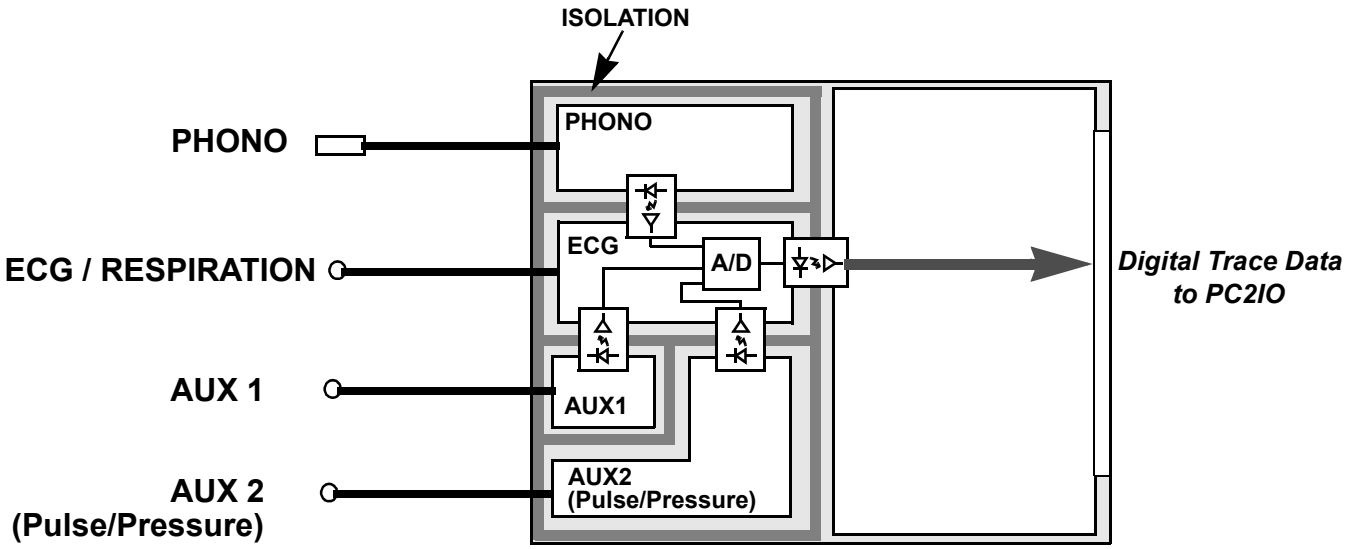


Figure 5-28 Patient I/O - Block Diagram

Inputs

- Phono (from a phono heart microphone)
- ECG / Respiration
- AUX1
- AUX2 (Pulse/Pressure)

These signals are optically isolated from the rest of the system.

Outputs

Serial Trace Data via Internal I/O to the SPD Board.

Section 5-11
Internal I/O

The **Internal I/O** is the interface between the Card Cage, PC Module, and the rest of the system, including the Top Console and the Peripherals. Table 9-21 on page 9-32 and Table 9-25 on page 9-44 have information on cable call-outs.

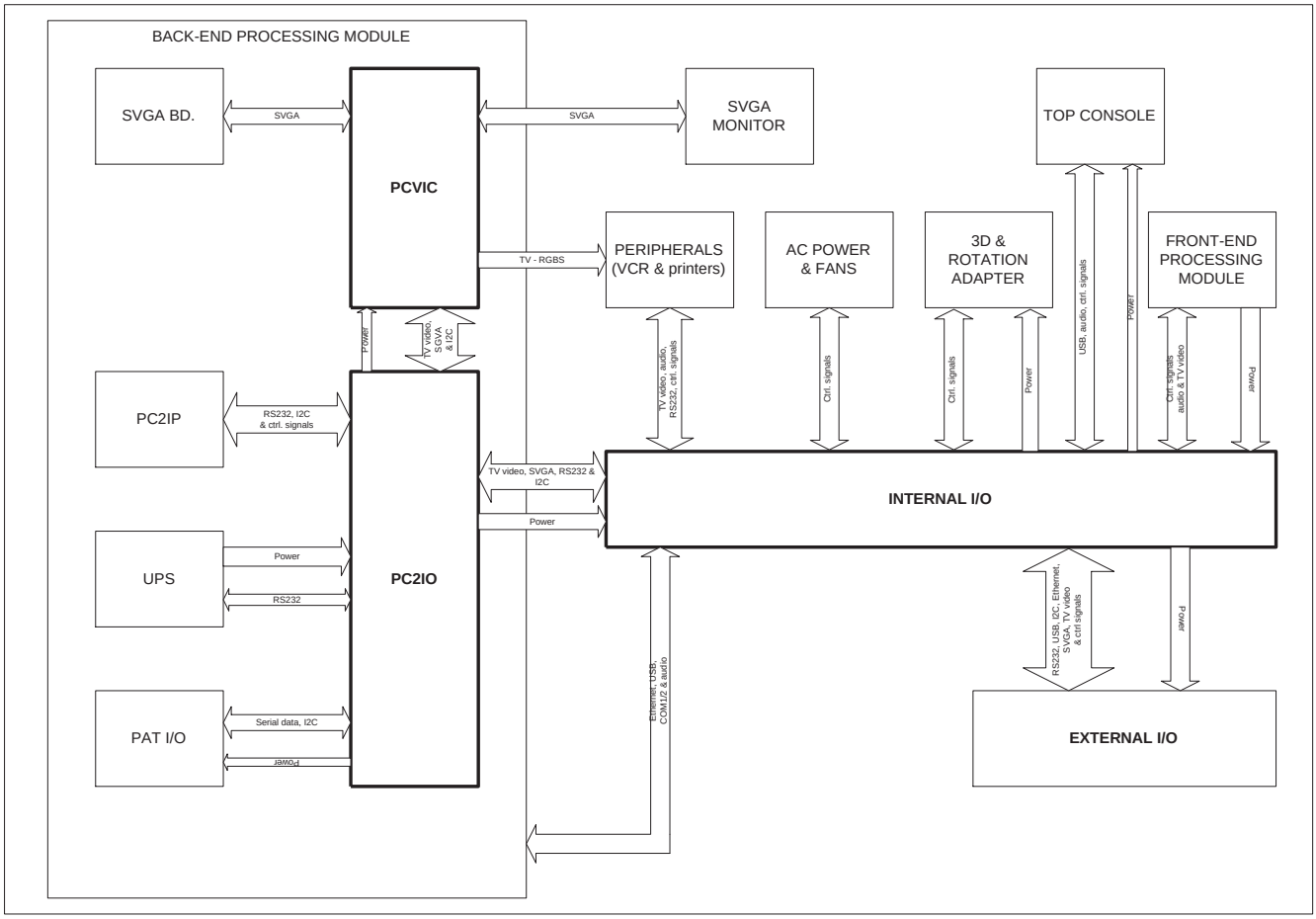


Figure 5-29 Internal I/O Basic Interconnect

Section 5-11 Internal I/O (cont'd)

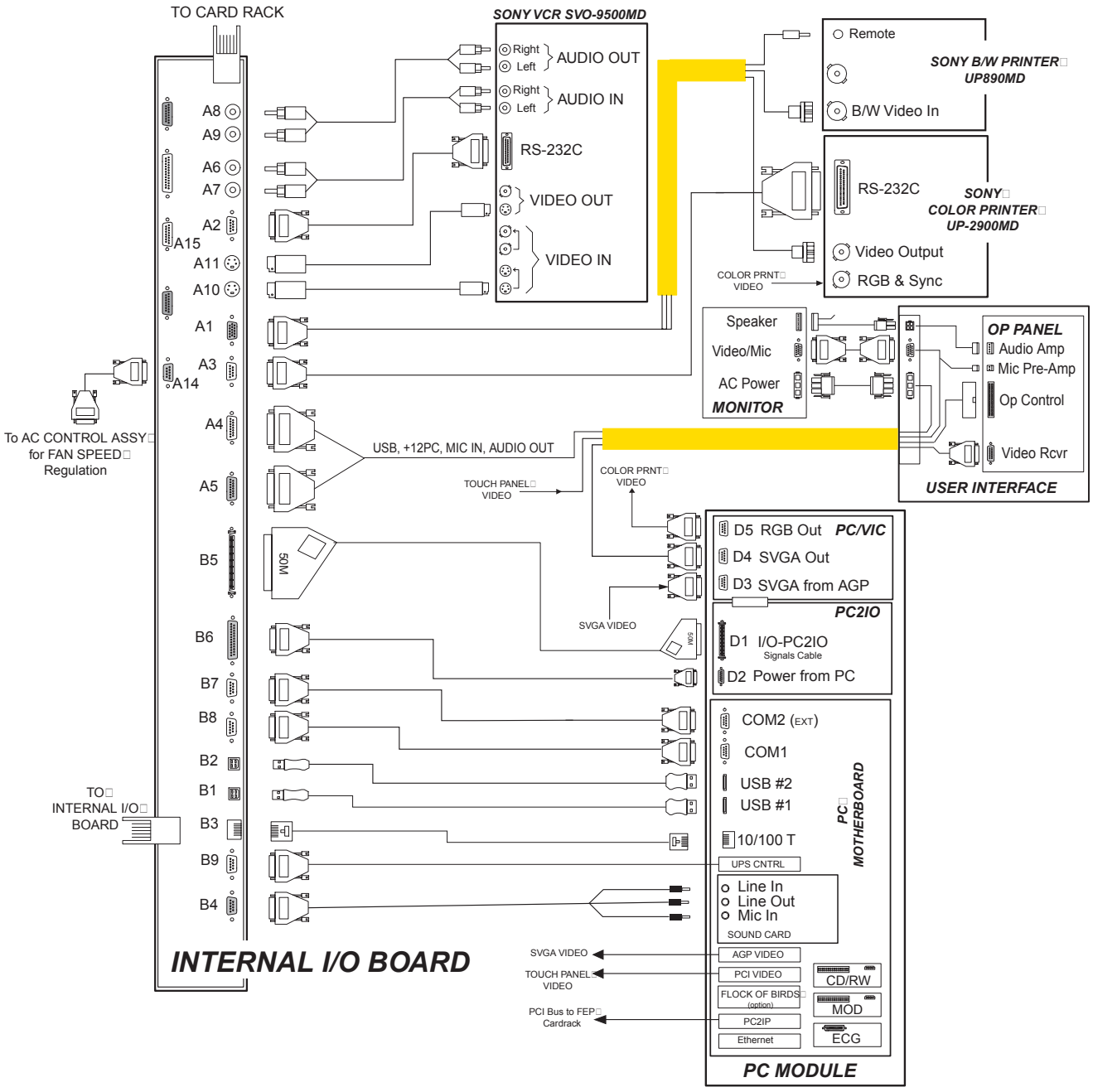


Figure 5-30 Internal I/O Module Overview

Internal I/O Enhancement for BT'03 (FC200423)

Modifications were made to the Internal I/O in October of 2003 to enhance the performance of the Microphone function. Resistor values were changed in the microphone amplifier circuit to increase the gain, a capacitor was added to reduce noise as well as a modified wiring scheme and differential pre-amp to reduce noise. This new FRU is backwards compatible.

Section 5-11 Internal I/O (cont'd)

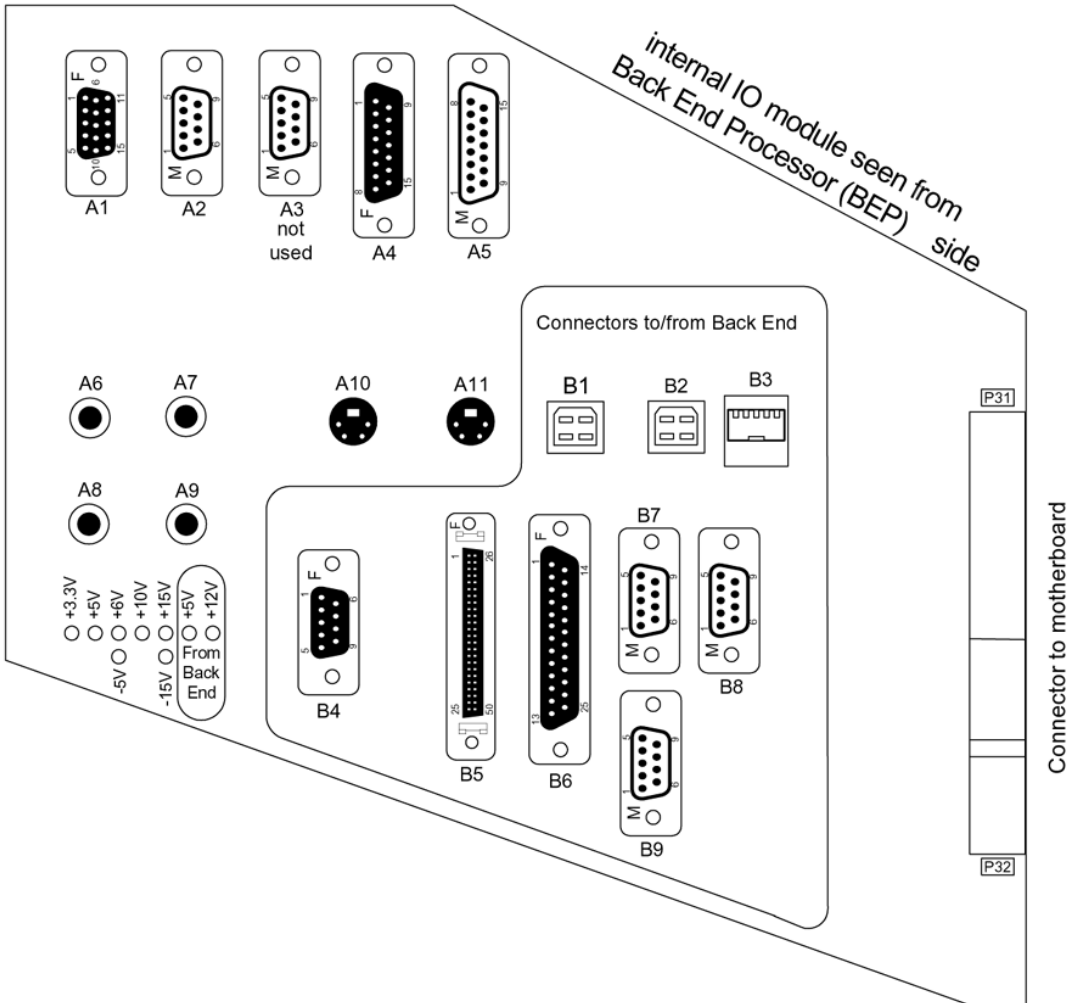


Figure 5-31 Internal I/O Back End Processor Connections

The Internal I/O board performs buffering and distribution of video and control data from various sources to multiple destinations.

- SVGA (R, G, B and Sync.) are fed from the BEP, directly up to the system monitor. Another set of RGB can be fed to a color printer.
- Composite video, black and white video and S-Video are buffered and distributed to VCR and printers.
- The analog Doppler signals are fed from the Spectrum Doppler board to the VCR audio inputs and through a switch where audio from VCR playback also is input, to the BEP and then to the speakers.
- Serial RS-232 interface signals from the BEP are fed to the destinations; VCR, Color Printer and Modem.
- Serial USB interface signals from the BEP are fed to the Front Panel and to EIO.
- Remote control signals for printers are generated on the I/O board.
- The Footswitch is connected to the I/O board.
- An AC Power Interface controls power on/off and fan speed.

5-11-1 Location in the Unit

The Internal I/O Module is plugged into the Card Rack (at the end nearest to the rear of the system).

5-11-2 LEDs

Nine green LEDs indicate that the respective DC Voltages are OK.

NOTE: The -15 V LED is not used on the LOGIQ™ 9. It is normal for it to be off (not lit).



Figure 5-32 Internal I/O: Green LEDs for Power Status.

5-11-3 Fuses

All output voltages are fused

5-11-4 Jumpers and Dip-switches

There are no Jumpers or Dip Switches on the Internal I/O.

5-11-5 Inputs

DC Voltages

Table 5-37 DC Input Voltages

Input	Description	Connection from
+3.3 VDC	Input DC Voltage	DC Power Supply > Backplane > J32
+5 VDC	Input DC Voltage	DC Power Supply > Backplane > J32
+10 VDC	Input DC Voltage	DC Power Supply > Backplane > J32
+15 VDC	Input DC Voltage	DC Power Supply > Backplane > J32
-15 VDC	Input DC Voltage	DC Power Supply > Backplane > J32
+6 VDC (analog)	Input DC Voltage	DC Power Supply > Backplane > J32
–5 VDC (analog)	Input DC Voltage	DC Power Supply > Backplane > J32
+5 VDC	Input DC Voltage	Backend Processor > J17
+12 VDC	Input DC Voltage	Backend Processor > J17)

Video Input Signals

Table 5-38 Video Input Signals

Input	Description	Connection from
SVGA	Video Signal to External I/O	PC2IO (Connector J16)
SVHS	Video Signal to VCR & External I/O	PC2IO(Connector J16)
SVHS	Video Signal to MBD (IMP)	VCR (Connector J11)
Luma	Video Signal to B&W Printer and External I/O	PC2IO (Connector J16)
Comp. Video	Video Signal to External I/O	PC2IO (Connector J16)
Comp. Video	Video Signal to MBD (IMP)	Color printer

Audio Input Signals

Table 5-39 Audio Input Signals

Input	Description	Connection from
Two channel audio	Audio signals, summed and distributed	MBD (IMP)
Two channel audio		VCR
Two channel audio		BEP

5-11-5 Inputs (cont'd)

Serial Ports

Table 5-40 Serial Ports

Input	Description	Connection from
USB	Standard USB Serial Bus	BEPM - Top console
USB	Standard USB Serial Bus	BEPM - IEIO
Ethernet	Standard Ethernet	BEPM - IEIO
RS232	Standard RS232 Serial Bus	BEPM COM1 - IEIO
RS232	Standard RS232 Serial Bus	BEPM COM2 - IEIO
RS232	Standard RS232 Serial Bus	PC2IO - Spare (J16)
RS232	Standard RS232 Serial Bus	PC2IO - VCR (J16)
RS232		PC2IO - Color printer (Connector J16)
RS232		PC2IO – UPS (Connector J16)

Control Signals

Table 5-41 Control Signals

Input	Description	Connection from
Control signals	Spare	MBD/FEC (Connector J16)
Control signals	Spare	MBD/FEC (Connector J16)
Trace trigger	To EIO	PC2IO (Connector J16)
Fan control signals	To AC Power	MBD (Connector J16)
Power control signals	To MBD and AC Power	PC2IO (Connector J16)
Power on/off	To Relay	Top Console ON/OFF Switch and EIO Test (Connector J16)
Standby	To Top Console	PC2IO (Connector J16)

5-11-6 Outputs

DC Voltage

Table 5-42 DC Output Voltages

Output	Description	Connection to
+5 VDC +12 VDC	From BEP	Spare (Connector J21)
+5 VDC, -15 VDC, -5 VDC $_{analog}$	From Card Rack	
+5 VDC +12 VDC	From BEP	Not Used
+5 VDC, -15 VDC, -5 VDC $_{analog}$	From Card Rack	
+5 VDC, +15 VDC,	From Card Rack	Not Used
+12 VDC	From BEP	Top Console
+15 VDC	From Card Rack	
+5 VDC +12 VDC	From BEP	EIO
+5 VDC, +15 VDC, -5 VDC $_{analog}$ +6 VDC $_{analog}$	From Card Rack	

AUDIO

Table 5-43 Audio Outputs

Output	Description	Connection to
Audio (two channels)	Audio (Doppler sound) from MBD (IMP), VCR, BEP	Top Console speakers and BEP
		VCR and IEIO

5-11-6 Outputs (cont'd)

Interface Connectors – Component Side

Table 5-44 Connectors, Component Side

Input	Description	Connection from
A1/J1	B&W printer, 15pins HD-sub, female.	
A2/P4	VCR remote ctrl – RS232: 9pins D-sub, male.	
A3/P5	Color printer - RS232: 9pins D-sub, male.	
A4/J2	Top Console - Power & signals: 15pins D-sub, female.	
A5/P4	Top Console - Signals: 15pins D-sub, male.	
A6/J6	Audio out to VCR, left: Phono jack.	
A7/J7	Audio out to VCR, right: Phono jack.	
A8/J8	Audio in from VCR, left: Phono jack.	
A9/J9	Audio in from VCR, right	
A10/J10	SVHS out to VCR	
A11/J11	SVHS in from VCR	
B1/J12	USB to Top console	
B2/J13	USB to external I/O	
B3/J14	Ethernet	
B4/J15	Audio I/O	
B5/J16	PC2IO signals	
B6/J17	PC2IO power	
B7/P18	COM1	
B8/P19	COM2	
B9/P25	UPS remote control	
J32	MBD – signals and power	

Table 5-45 Connectors, Solder side

Input	Description	Connection from
A12/J21	Spare power, 15pins D-sub, female	
A13/J20	Spare – power, 15pins D-sub, female	
A14/J24	AC power ctrl, 9pins D-sub, female	
A15/P23	Rotation adapter – signals, 15pins D-sub, male	
A16/P22	Spare – signals, 25pins D-sub, female	
P30	EIO – signals and power, 110pins male	

Section 5-12
Top Console

The **Top Console** includes a Stand By/On switch, a keyboard, different controls for manipulating the picture quality, and controls for use in Measure & Analyze (M&A).



Figure 5-33 Top Console

BT'03 Consoles added a USB connector to the Upper Op Panel for the Wired Voice Scan Option. This connection should only be used for Wired Voice Scan.



Figure 5-34 BT'03 Top Console

Section 5-13
Monitor

17-inch High Resolution Monitor with no interlace scan includes loudspeakers for stereo sound output (used during Doppler scanning).



Figure 5-35 Monitor

Section 5-14
External I/O

The External I/O is the interface between the scanner and all external items.

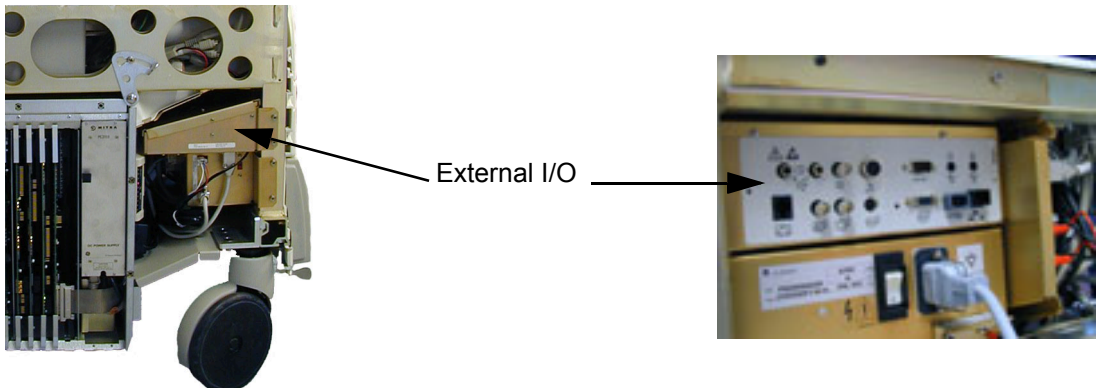


Figure 5-36 External I/O

5-14-1 Location in the Unit

On the rear of the scanner, above the power inlet and power breaker.

5-14-2 Input Signals

Table 5-46 Input Signals

Input	Description	Connection from/via/to
Footswitch Connector	Footswitch is a mechanical switch that connect a signal to ground. Internal level is TTL (0-3.3V)	Footswitch > External I/O > Internal I/O > PC2IO (BEP)
DC Voltages from BEP		
+5 VDC	Used for Optical Couplers on RS232 signals	PC2IO (BEP) > Internal I/O > External I/O
+12 VDC		
DC Voltages from Card Rack		
+5 VDC	Used for Optical Couplers on Footswitch	Card Rack > Internal I/O > External I/O
+15 VDC		
-5 VDC $_{analog}$		
+6 VDC $_{analog}$		

5-14-3 Bi-directional Signals

Table 5-47 Bi-directional Signals

Signal Name	Description	Signal Path
Ethernet	Standard 10/100 Base TX Ethernet	Ethernet - External I/O - Internal I/O - BEP (Ethernet Connector)
COM1	Serial RS-232 port (Can be configured to transfer report page data to an external processor)	External Device - External I/O - Internal I/O - BEP (COM1)
USB	Standard USB (Universal Serial Bus), (0-5V)	USB Device - External I/O - Internal I/O - BEP (USB #2))
Modem	Internal Modem Telephone Line Connection	Analog Phone Line - External I/O (Connector Panel) - External I/O (Rear Side)- Modem
COM2	Serial RS-232 port (on rear side of External I/O)	Modem - External I/O (Rear Side) - Internal I/O - BEP (COM1)
Burn-in Power On/Off Control	Burn-in Power On/Off Control (on rear side of External I/O) - Used for factory testing.	External I/O (Rear Side) - Internal I/O

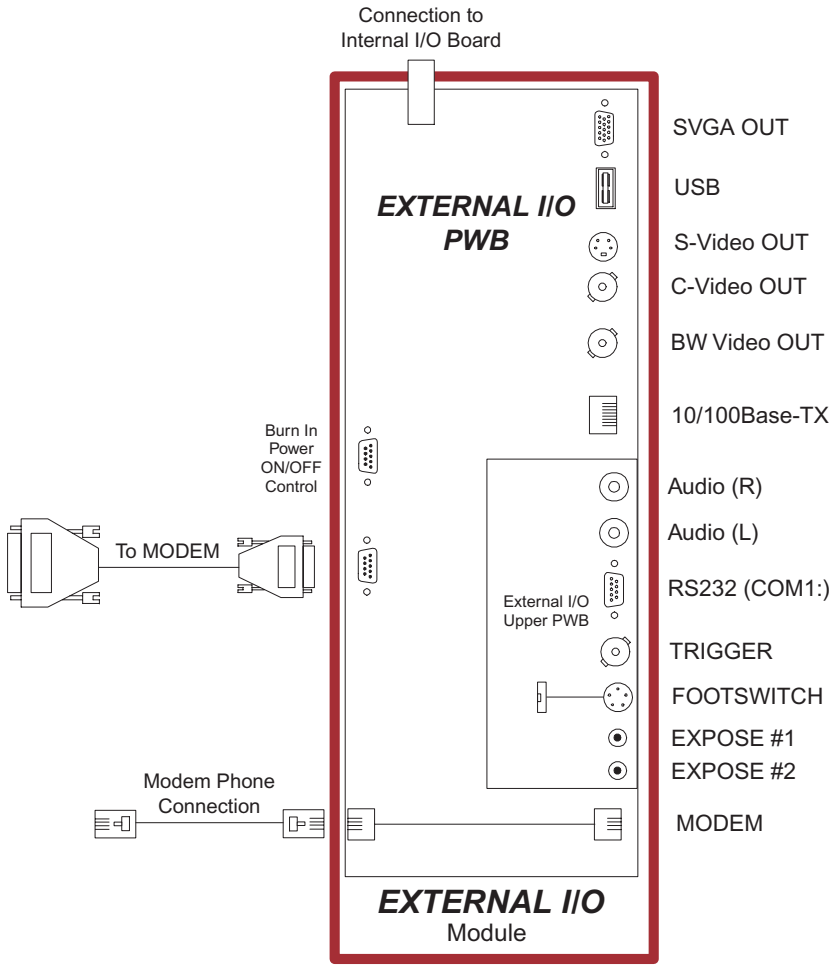


Figure 5-37 External I/O

5-14-4 Output Signals

Table 5-48 Output Signals

Signal Name	Description	Signal Path
Stereo Audio	Stereo audio to external VCR. (Same signal as delivered to internal VCR).	Audio Source (Internal VCR/Microphone/BEP) > Internal I/O > External I/O > External VCR.
Composite Video	External composite video, 1.0Vp-p, 75 ohms, unbalanced, sync negative.	PC2IO (BEP) > Internal I/O > External I/O > External Composite Video Device
Super Video (SVHS)	Super Video Luminance: 1.0Vp-p, 75 ohms, unbalanced. Color: 1.0Vp-p, 75 ohms, unbalanced.	PC2IO (BEP) > Internal I/O > External I/O > External VCR
Black and White video	External black and white video 1.0Vp-p, 75 ohms, unbalanced, sync negative.	PC2IO (BEP) > Internal I/O > External I/O > External B/W Video Device
Trig	Trigger Signal, 0-3.3V	
SVGA	SVGA (RGBS) high resolution video output (Same signal as sent to the systems monitor)	PCIDG/DG VIC > PC2IO (BEP) > Internal I/O > External I/O > External Monitor
Remote Expose #1	A SW controllable relay, to control external peripherals	PC2IO (BEP) > Internal I/O > External I/O > External Peripheral
Remote Expose #2	A SW controllable relay, to control external peripherals	PC2IO (BEP) > Internal I/O > External I/O > External Peripheral

Several signal are fed from the Internal I/O board to an External I/O board located on the rear of the system. This board contains data buffers and a galvanic isolation section.

Different types of signals are fed to connectors accessible on the External I/O.

- R, G, B and Sync are provided for external RGB monitors or printers.
- Composite video, black and white video and S-VHS video are buffered and fed to output connectors for external monitors and printers.
- Two serial RS-232 ports are provided for external communication with e.g. the System CPU.
- An Ethernet signal from the BEP is fed to an Ethernet connector. It is used for connectivity, including DICOM Network.

Section 5-15 Peripherals

A VCR, an analog or digital Black-and-White Video Printer and an analog or digital Color Printer may be installed on the scanner. These devices receive video signals from the Internal I/O Board and power from the AC Control Box.

Peripherals are generally specified and approved regionally.

BT’02 (BEP 2.1 and above) systems have digital peripheral capabilities through USB or USB To SCSI converters.

Section 5-16
Modem and USB Modem

5-16-1 General Description

Multi-Tech global modem. The modem is a standard modem that connects to an analog phone line.

A USB Modem was introduced at BT'04. The USB modem does not require external power, and has no serial connection as it plugs directly into the back of the BEP.

5-16-2 Location in the Unit

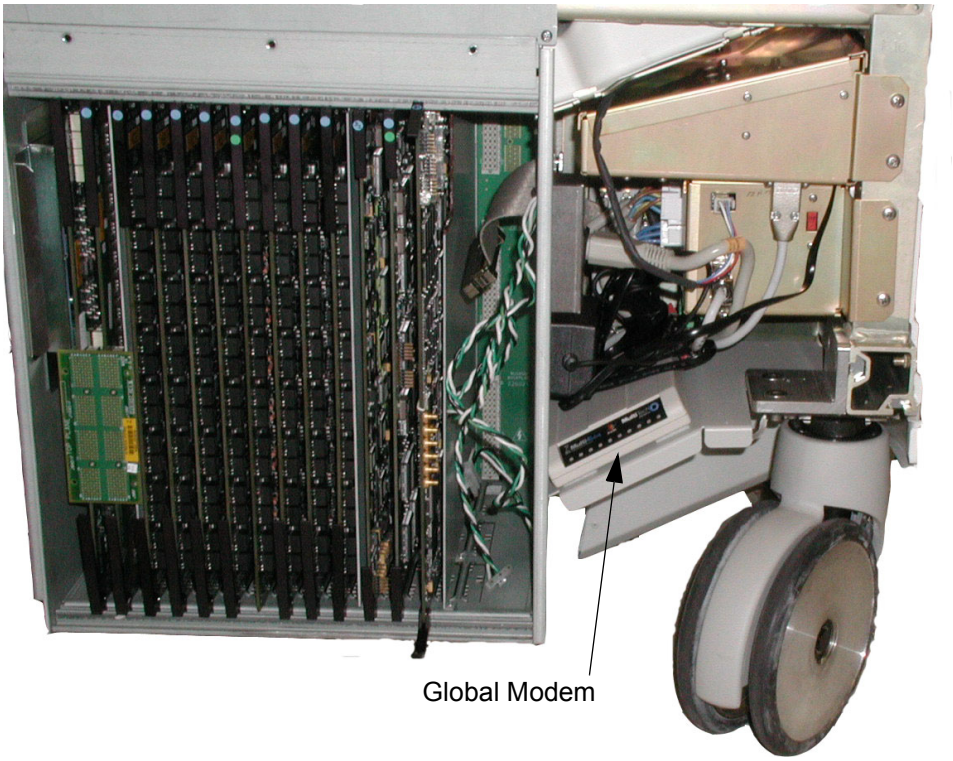


Figure 5-38 Modem: Location in Unit

5-16-3 Inputs/Outputs (non-USB Modem)

- DC Voltage from Modem Power (AC/DC Converter)
- RS232 from Backend Processor via Internal I/O and External I/O
- Analog Phone line via External I/O

5-16-4 Fuses

None

5-16-5 Jumpers and Dip-switches

None

5-16-6 LEDs (non-USB Modem)

The Modem has 10 LEDs on its front.



Figure 5-39 LEDs on Modem's Front Panel

Table 5-49 LEDs on Modem

LED Color	Description	Normally State
- Red	TD (Transmit Data)	Flashes during use.
- Red	RD (Receive Data)	Flashes during use.
- Red	CD (Carrier Detect)	ON when detecting a carrier from another modem and during communication. OFF indicates no or broken connection.
- Red	56 (56K Mode)	During Power On: Briefly Flashing These LEDs indicates communication speeds above 14 kbs. If one of this LEDs are ON during communication, it will stay ON until the modem is reset or connected the next time. At speeds below 14 kbs, these LEDs are OFF.
- Red	33 (V.34 Mode)	
- Red	14 (V.32bis Mode)	
- Red	OH (Off hook)	ON when dialing, online, or answering a call Flashes if puls dialing Off when modem not in use
- Red	TR (Terminal Ready)	ON when the system initializes the modem. It indicates that the modem is ready for an outgoing or incoming call. OFF indicates that communication on the RS232 (COM) port has been broken. The connected (remote) modem will disconnect.
- Red	EC (Error Correction (V.42))	ON: Error Correction (V42) is turned ON Blinking: Compression turned ON OFF: Normal operation.
- Red	FX (Fax)	Always OFF

Section 5-17
Power Distribution

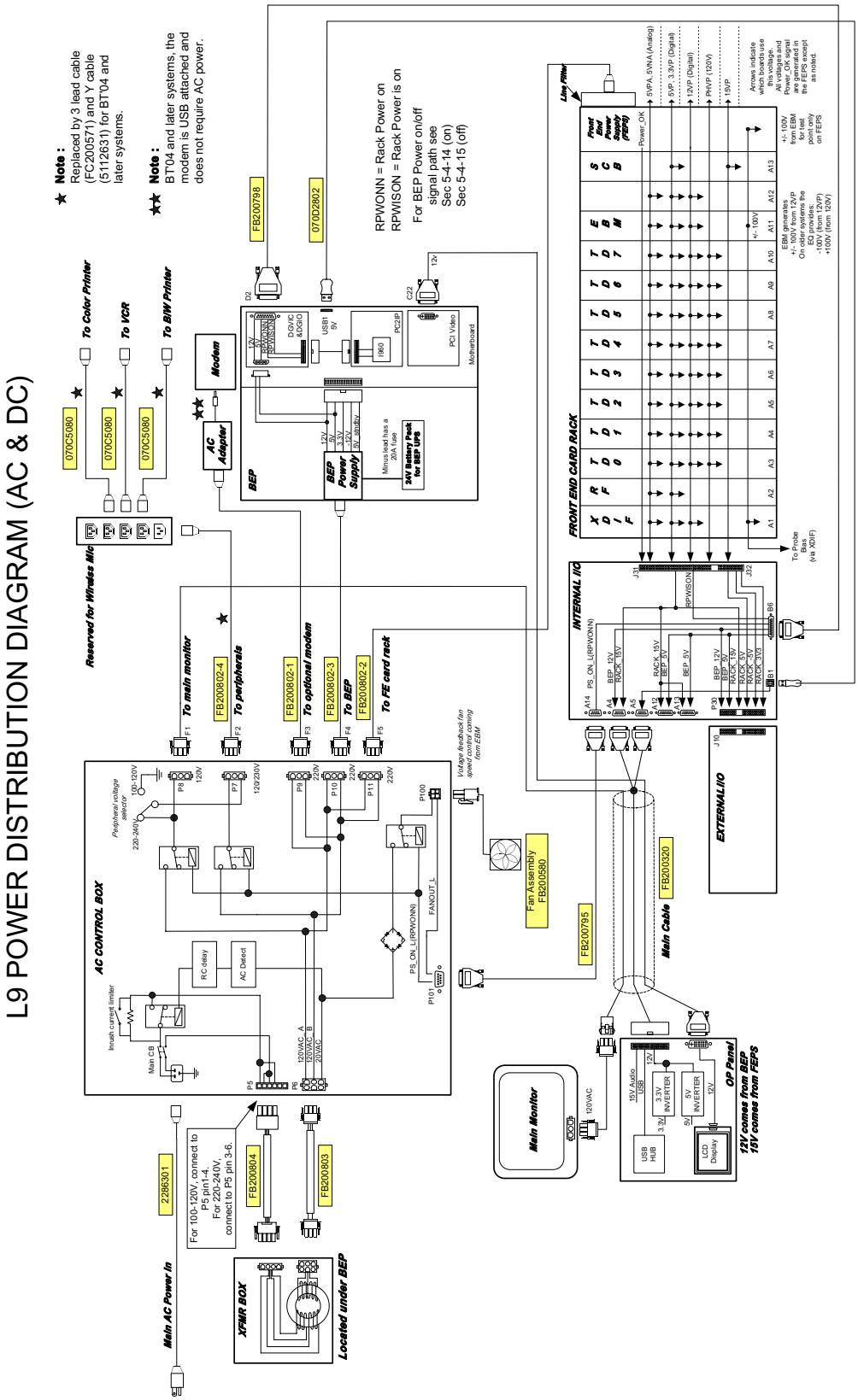


Figure 5-40 Overall Power Distribution

5-17-1 AC Power Distribution Overview

The AC Power's main tasks are to supply the various internal subsystems with AC power and to galvanically isolate the scanner from the on site Mains Power System. To reduce inrush current, an inrush current limiter as well as an EMI filter. Voltage to peripherals can be configured to either 115 VAC or 230 VAC. The AC Power also controls and supplies the 20VAC needed by the systems cooling fan.

5-17-2 AC Power PWB

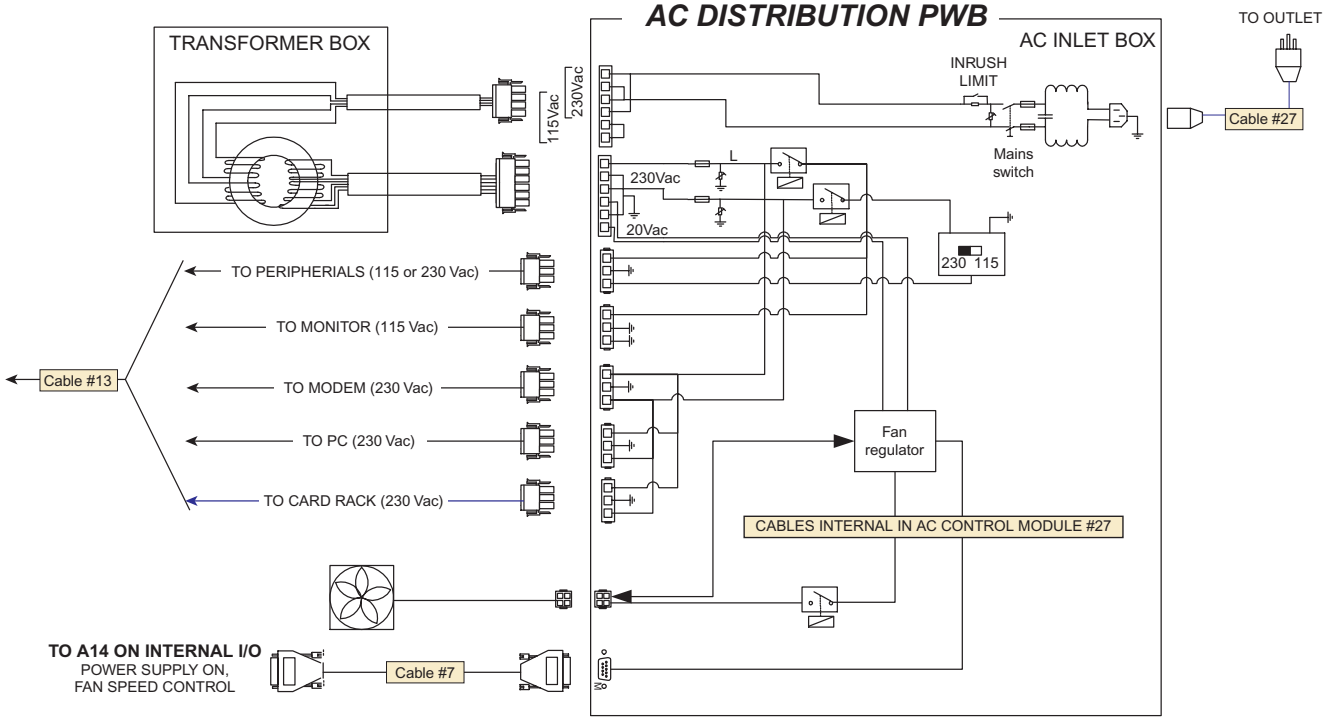


Figure 5-41 AC Power Distribution

The mains cord has plugs in both ends. A female plug connects to the scanner and a male plug to the mains outlet on site.

The mains voltage is routed via an EMI filter to the Mains Switch, located on the rear of the system.

The Mains Switch is of the auto fuse type, if for some reason the current grows to high, the switch will automatically break the power.

From the Mains Switch, the AC power is routed via an Inrush Current Limiter (titled: Inrush Limiter in Figure 5-41) to a internal outlet connector for the Mains Transformer.

5-17-2 AC Power PWB (cont'd)

The Transformer is the galvanic barrier between the rest of the scanner and the on site AC Mains.

Input voltage to the transformer can be either 230VAC or 115 VAC (two different part numbers/FRUs). The configuration of the plug on the cable to the AC Transformer is different for the two AC Voltages.

From the AC Transformer, there are three outlets;

- 20 VAC
- 115 VAC
- 230 VAC

The 20 VAC is routed via the fan regulator to the system fan. (See separate description, *Chapter 5 - Air Flow Control*).

The 115 VAC is routed via a fuse to an AC Voltage selector, used for selecting the right output voltage for the Peripherals outlet and the Monitor. (The alternative voltage to this outlet is 230 VAC.)

The 230 VAC output from the Transformer is routed via a fuse and distributed to the AC Voltage selector for the Peripherals outlet and to the following AC outlets:

- Modem
- Back End Processor
- Card Rack

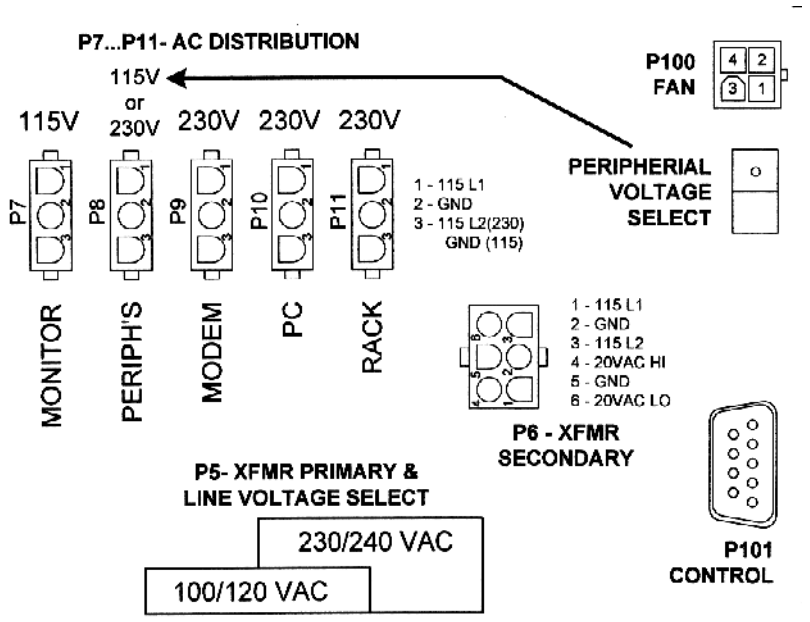


Figure 5-42 Connectors on Back of AC Controller

5-17-3 AC Controller Differences

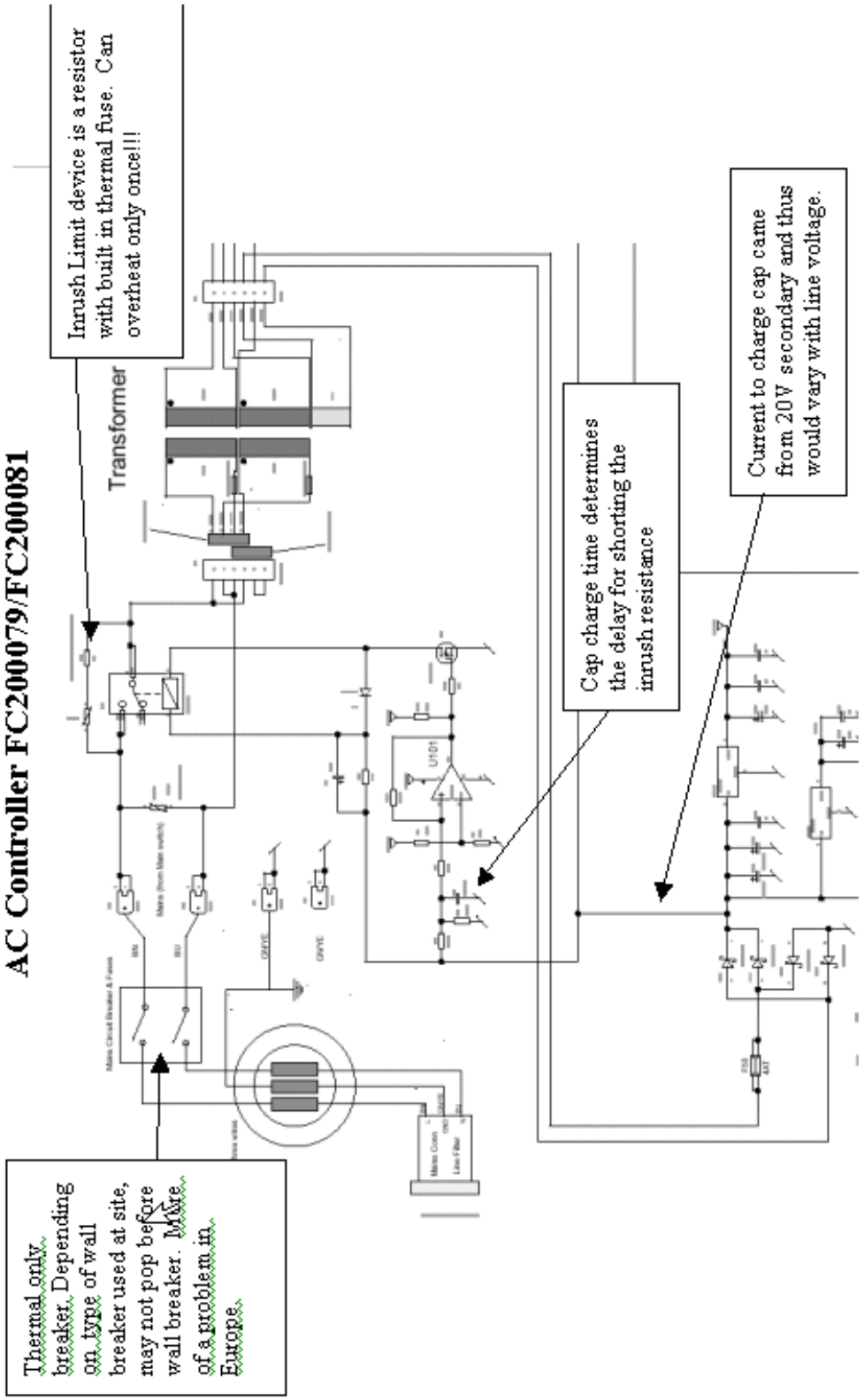

AC Controller FC200079/FC200081
Inrush Limit device is a resistor with built in thermal fuse. Can overheat only once!!!
Transformer
Cap charge time determines the delay for shorting the inrush resistance
Current to charge cap came from 20V secondary and thus would vary with line voltage.
Thermal only breaker. Depending on type of wall breaker used at site, may not pop before wall breaker. More of a problem in Europe.

Figure 5-43 Original AC Controller Functions

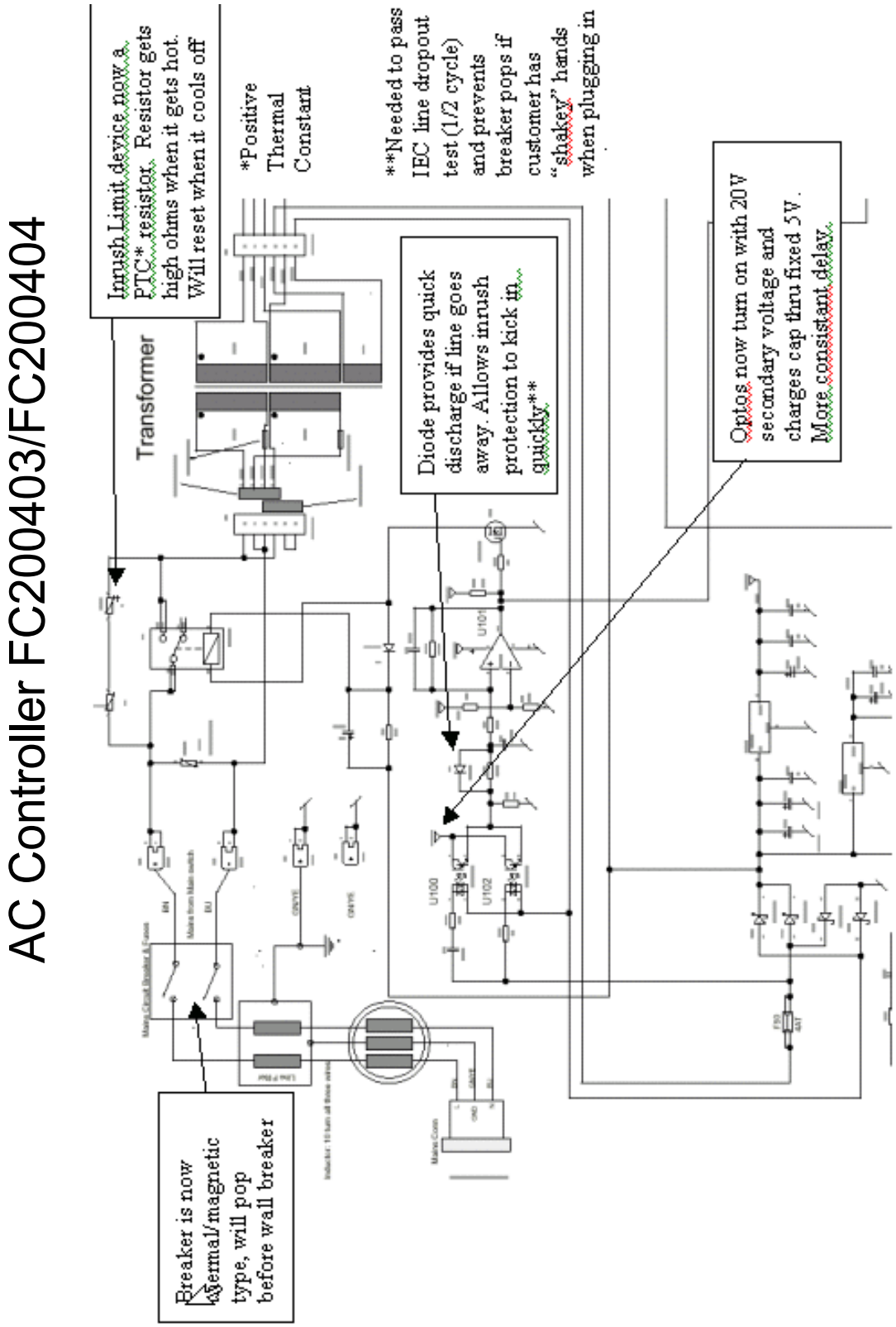

AC Controller FC200403/FC200404
Inrush Limit device now a PTC* resistor. Resistor gets high ohms when it gets hot. Will reset when it cools off
*Positive Thermal Constant
**Needed to pass IEC line dropout test (1/2 cycle) and prevents breaker pops if customer has "shakey" hands when plugging in
Transformer
Diode provides quick discharge if line goes away. Allows inrush protection to kick in quickly.**
Optos now turn on with 20V secondary voltage and charges cap thru fixed 5V. More consistant delay.
Breaker is now thermal/magnetic type, will pop before wall breaker

Figure 5-44

Section 5-18
Mechanical Descriptions

5-18-1 Monitor

- Tilt: 10° forwards and backwards
- Swivel: 90° rotation.

5-18-2 Top Console Positioning



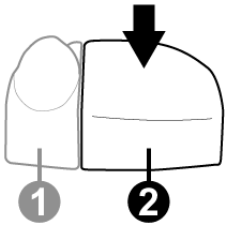
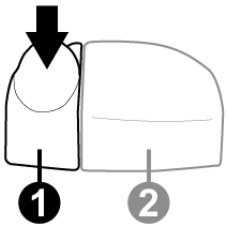
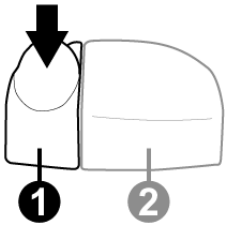
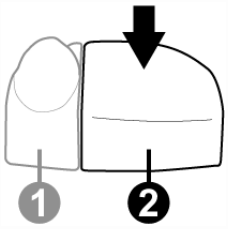
Figure 5-45 Top Console Positioning

- Vertical Access: The control panel offers 27 inches (200 mm) of vertical adjustment.
- Horizontal Access: The control panel offers 45° of horizontal adjustment when the Z-arm is released.

5-18-3 Wheels/Brakes

Check that the brakes and direction locks function as described below.

Table 5-50 Brakes and Direction Lock Instructions

Step	Task	Expected Result(s)	
1.	Press on pedal no. 2 	To engage the brakes in full lock	
2.	Press on pedal no.1 	To release the brake	
3.	Press on pedal no.1 	To engage swivel lock. You may need to move the system around a little to get the wheels to lock into the locked direction.	
4.	Press on pedal no. 2 	To release swivel lock	

*NOTE: The swivel lock and brake cannot be engaged (pressed down) at the same time since pressing the main brake releases the swivel lock and pressing the swivel lock releases the main brake. Therefore, if the swivel lock is engaged you need to press the main brake pedal (#2) **twice** to lock the scanner from rolling. Once will release the swivel lock and once again will engage the main brake in full lock as stated in step 1.*

Section 5-19
Air Flow Control

5-19-1 Air Flow Distribution

The fan at the rear of the scanner draws air into the scanner, through the foam filter, and pushes it through a flange that moves the air into a cavity on top of the card rack.

Air holes in the bottom of this cavity allow the air to move down through the card rack. Air exits the card rack through holes on its internal side panel into the interior of the scanner near the rear of the Backend Processor.

The internal fan in the Backend processor draws the air into the PC allowing it to pass through the interior of the PC, and exit the lower front area of the scanner.

Section 5-20
Service Platform

5-20-1 Introduction

The Service Platform contains a set of software modules that are common to all ultrasound and cardiology systems containing a PC backend. This web-enabled technology provides linkage to e-Services, e-Commerce, and the iCenter, making GE's scanners more *e-enabled* than ever. The Service Platform will increase service productivity and reduce training and service costs.

5-20-2 Global Service User Interface (GSUI)

5-20-2-1 Internationalization

The user interface provided by the service platform is designed for GE personnel and as such is in English only. There is no multi-lingual capability built into the Service Interface.

5-20-2-2 Service Login

Select the wrench icon in the status bar at the bottom of the scan display screen. This icon links the user to the service login screen.

NOTE: In R4.x.x software the wrench icon has been removed from the upper display. To access the Service Platform, click on Utility, then select Service.

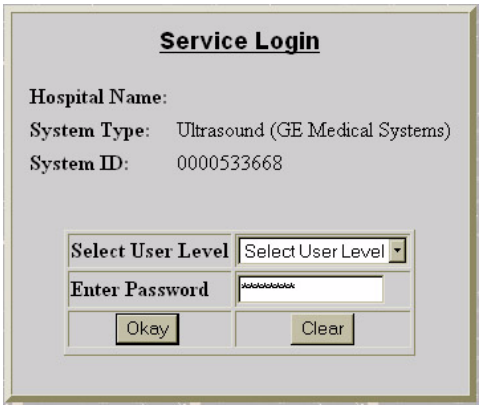


Figure 5-46 Login Screen for Global Service User Interface

5-20-2-3 Access / Security

The service interface has different access and security user levels. Each user is only granted access to the tools that are authorized for their use.

*NOTE: OnLine Center access to the scanner requires a password and they must have '**Disruptive**' permission and customer input to run diagnostics.*

Table 5-51 Service Login User Levels

User Level	Access Authorization	Password
Operator	Authorized access to specified diagnostics, error logs and utilities. Same acquisition diagnostic tests as GE Service.	uls
Administrator		uls
External Service		gogems

Every access request, whether successful or not, will be logged into a service access log that is viewable to authorized users.

5-20-3 Service Home Page

The navigation bar at the top of the screen allows the user to select from several tools and utilities.

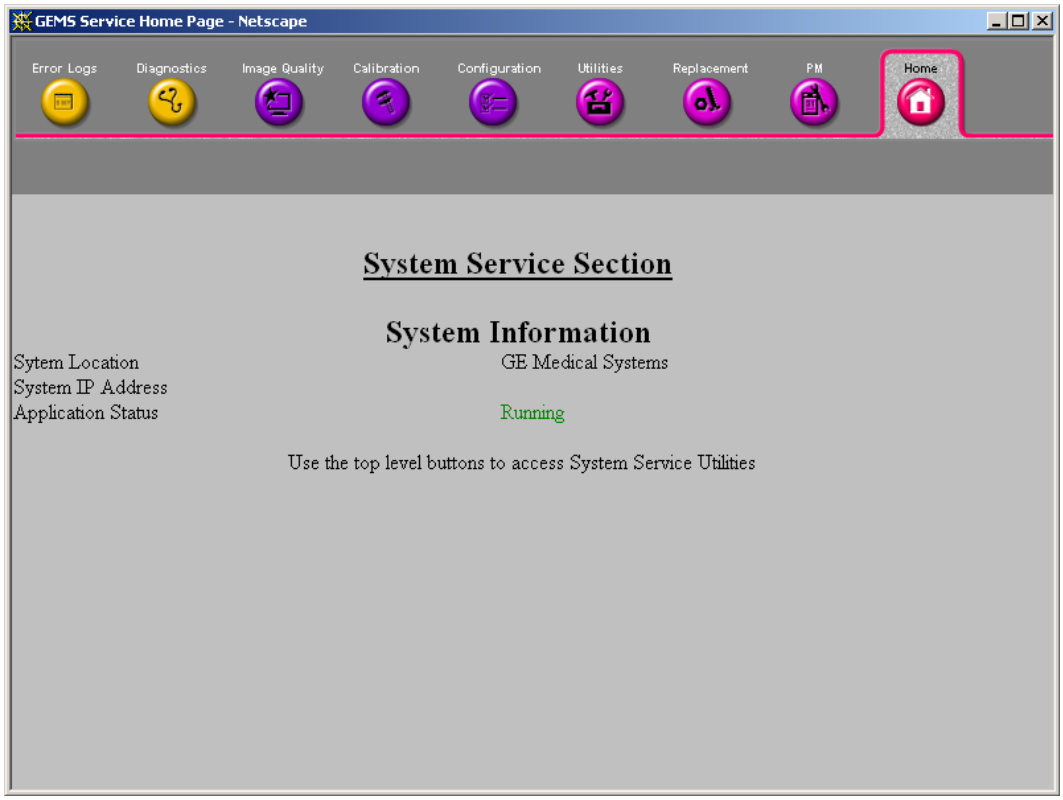


Figure 5-47 Customer Service Home Page

5-20-4 Error Logs Tab

From the Error Logs Tab the Log Viewer displays four categories with pull-down sub-menus and an Exit selection. The Service Interface allows scanner logs to be viewed by all service users.

NOTE: Beginning with R4.x application software, some of the Log Viewer screens are different than those shown in this section. However, the basic functionality has not changed. Also, some additional navigational features have been added, such as Last Page and Get Page.

The **Filter** Error log is keyed to GE Service login access permissions and is not available to customer level analysis.

NOTE: Beginning with R4.x application software, filtering has been removed and all users have the same access to the logs.

The log entries are color-coded to identify the error level severity at a glance.

Table 5-52 Log Entry Key

Severity	Error Level	Color Code
1	Information	Green
2	Warning	Blue
3	Error	Red

The Service Interface supports the transfer of these logs to local destinations such as the MOD, CD-Rom or DVD drive.

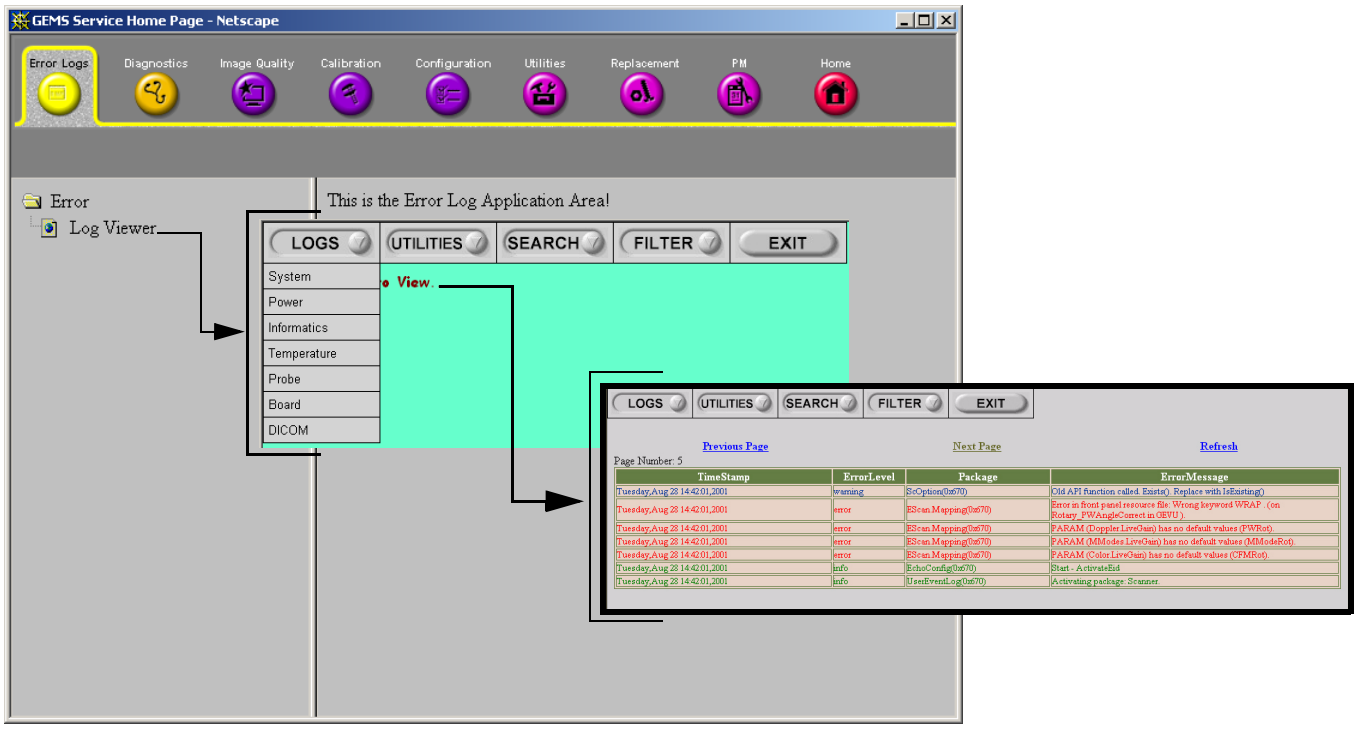


Figure 5-48 Log Viewer / Logs / Log Entries

5-20-4-1 Logs

The eight sub-menus of the Logs category are System, Power, Infomatics, Temperature, Probe, Board, DICOM, and UPS Power.

*NOTE: Figure 5-48 provides a graphical example of the log entries for the **System Logs**.*

Log table headings for the different logs are as follows:

- **System**

  Log entry headings include Time Stamp, Error Level, Package, and Error Message.

- **Power**

  Log entry headings include Time Stamp, Error Level, Analog_5V, DC_5V, DC_3.3V, Pos_15V, Analog_12V, Pos_HV, Neg_5V, Pos_100V, Neg_100V.

NOTE: For systems running R2.x and R3.x application software, the log entry headings include Time Stamp, Error Level, Package, and Error Message.

NOTE: In R4.x application software, the Power log present in R2.x and R3.x application software was renamed UPS Power as described below.

NOTE: All readings in the Power log are in mV. Readings for analog voltages will vary depending on whether the system has an FEPS2.x or FEPS3.x. It is normal for the Pos_HV, Pos_100V, and Neg_100V to read 0. Readings for these voltages are not captured in this log. To check these voltages, run the Power Supply diagnostic.

- **Infomatics**

  Log entry headings include TimeStamp, Revision, PtID, PtDOB, PtSex, PtWeight, PtHeight, ExamID, ExamCategory, ExamCurDate, ExamStartTime, ExamEndTime, ActiveScanTime, FreezeTime, TimeOfImageArchived, AccessionNumber, RefPhyName, ReadingPhyName, Operator, RoomNo, BodyPatternSelected, InstitutionName, ActiveModeTime, CalculationMade, CalculationTime, HelpUsage, ProductName, SystemSWRev, NoOfSWModules, SystemPowerOnTime, SystemIdleTime, NoOfBoards, ProbeChangedDate, ProbeChangedTime, ProbeChangedStatus, NoOfProbeSlots, NoOfProbes, ProbeID, ProbeSerialNumber, and ActiveExamProbes.

- **Temperature**

  Log entry headings include Time Stamp, Error Level, Package, Upper FEC Sensor, and Lower FEC Sensor.

NOTE: In R4.x application software, the log entry headings include Time Stamp, Error Level, Package, Average, TD0, TD1, TD2, TD3, TD4, TD5, TD6, TD7, EQOut, EQIn, and RFI.

- **Probe**

  Log entry headings include Time Stamp, Error Level, Package, Error Message, Severity, Revision, and three (3) new labels that have not yet been named.

- **Board**

  Log entry headings include Time Stamp, Error Level, Package, Board, Severity, and two (2) new labels that have yet been named.

- **DICOM**

  Log entry headings include Time Stamp, Error Level, Package, and Error Message.

- **UPS Power**

  Log entry headings include Time Stamp, Error Level, Package, and Error Message.

NOTE: This log was called Power in R2.x and R3.x application software.

5-20-4-2 Utilities

The two sub-menus of the **Utilities** category are Plot Log, and Plot Page.

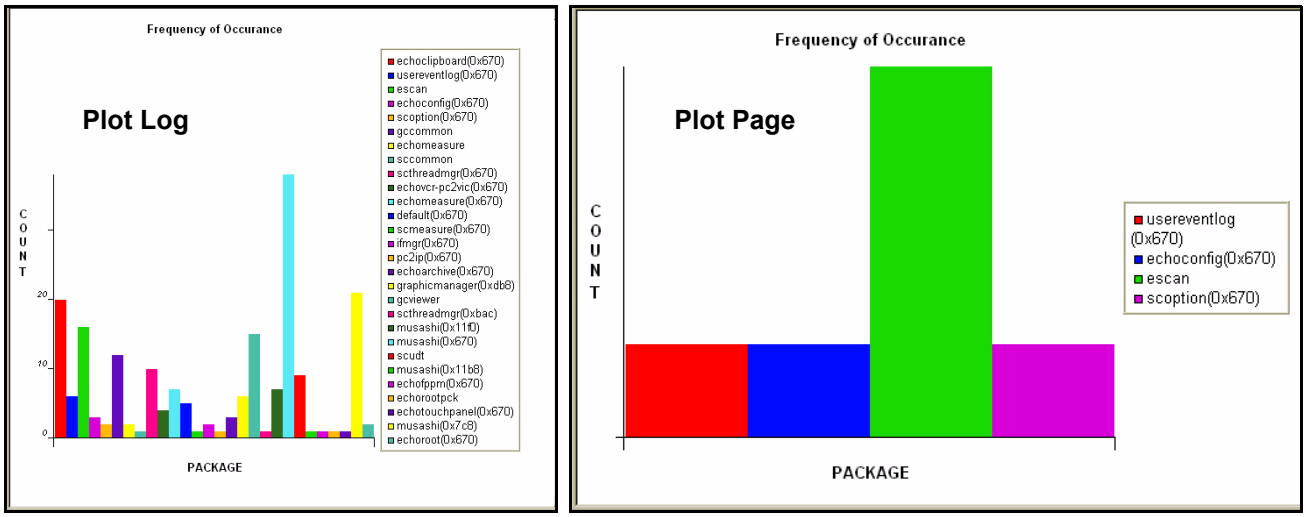


Figure 5-49 Utilities Sub-Menus

- **Plot Log**

  Allows for the color coded plot of all Log contents with the package on the ‘x’ axis and incident count on the ‘y’ axis.

- **Plot Page**

  Allows for the color coded plot of all Page contents with the package on the ‘x’ axis and incident count on the ‘y’ axis.

5-20-4-3 Search

On the Text Search sub-menu of the **Search** category, users enter case-sensitive text they wish to find. This filter field works well for filtering the Sys log file for the word “fail”.

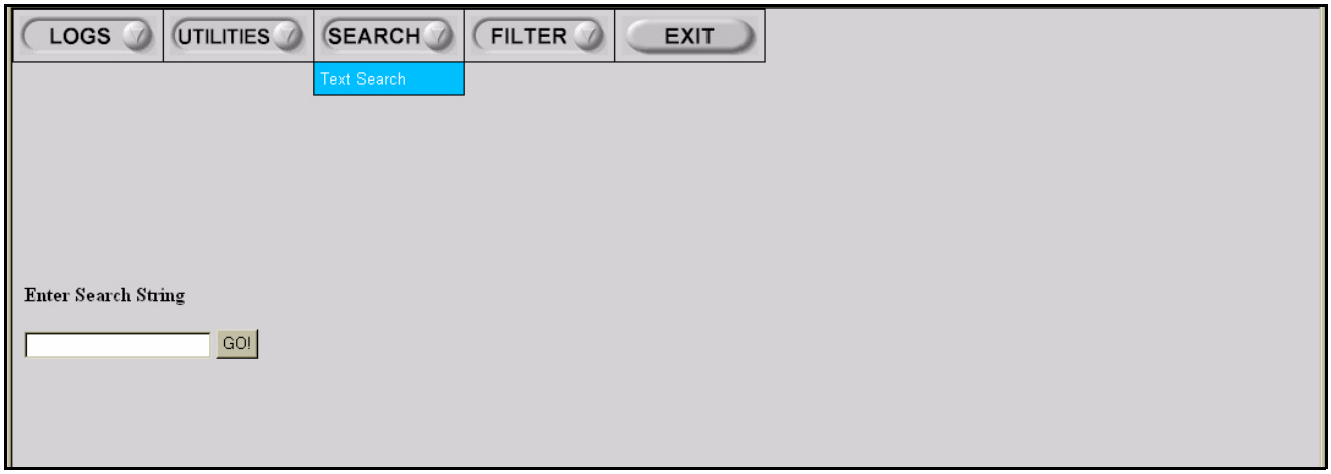


Figure 5-50 Search Sub-Menu

5-20-4-4 Exit

The sub-menu, **Exit Log Viewer**, returns the user to the Service Desktop home page.

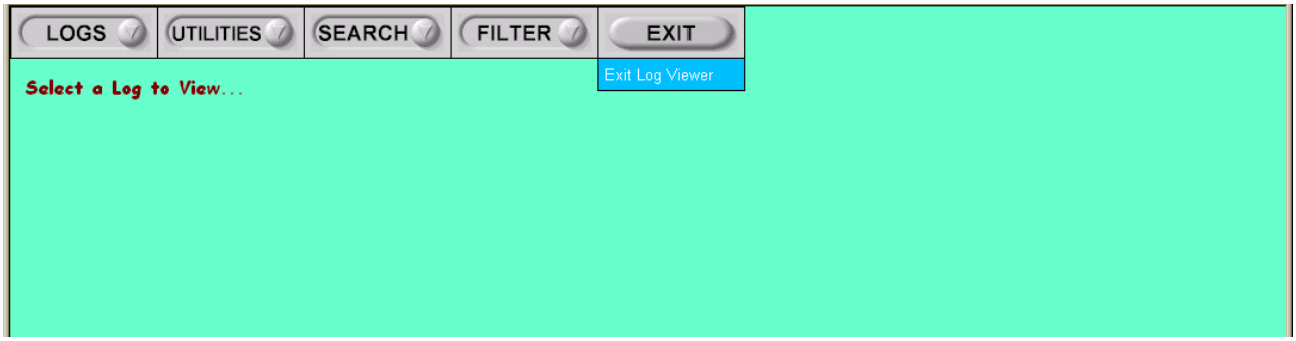


Figure 5-51 Exit Log Sub-Menu

5-20-5 Diagnostics

Detailed **Diagnostic** information is found in **Chapter 7 - Diagnostics/Troubleshooting**.

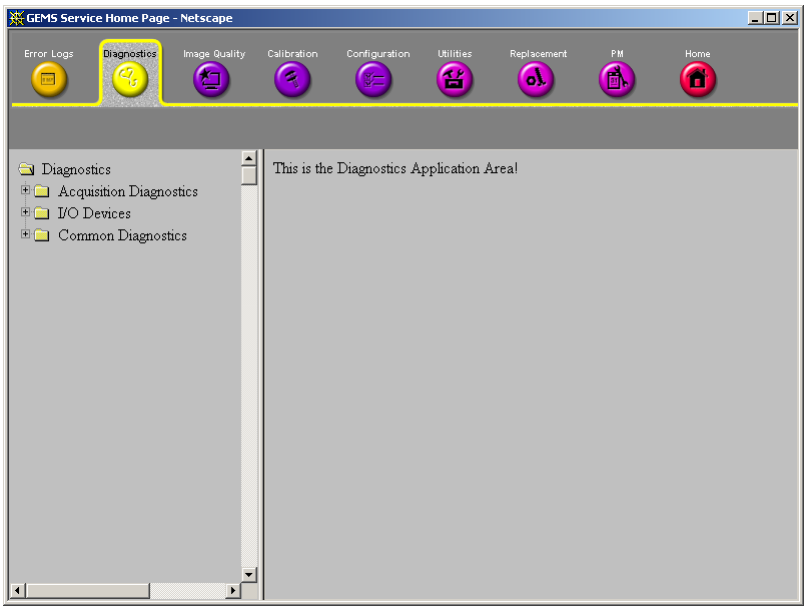


Figure 5-52 User Diagnostic Page

5-20-5-1 Diagnostics Execution

Diagnostic tests are executable by both local and remote users. The Service Platform provides top-level diagnostic selection based on the user's level and login access permissions. Remote access will require disruptive diagnostic permissions to run Acquisition diagnostics.

5-20-5-2 Diagnostic Reports

Diagnostic tests return a report to the Service Platform. The platform retains the report and allows for future viewing of the diagnostic logs.

5-20-6 Image Quality

The **Image Quality** page is intended to contain tools for troubleshooting image quality issues.

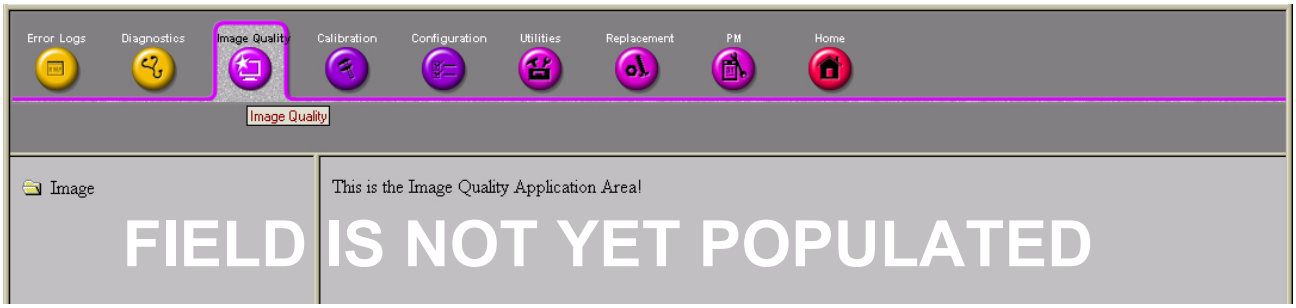


Figure 5-53 Image Quality Page

5-20-7 Calibration

The **Calibration** page is intended to contain the tools used to calibrate the system.

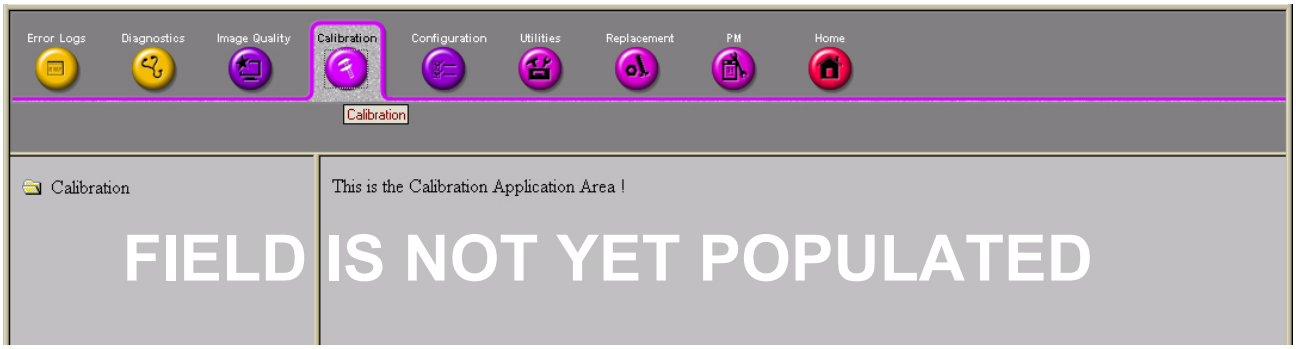


Figure 5-54 Calibration Page

5-20-8 Configuration

The **Configuration** page is intended to be used to setup various configuration files on the system.

The Service Platform is the access and authorization control for remote access to the configuration subsystem.

The enable/disable of software options can be done from this Configuration page.

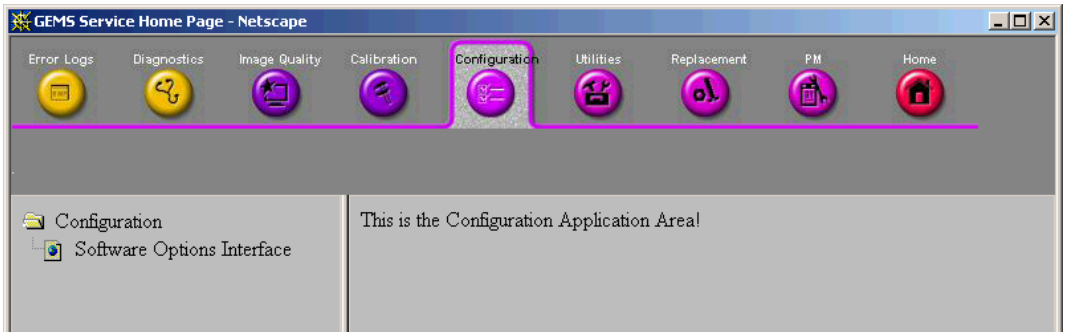


Figure 5-55 Configuration Page

5-20-9 Utilities

The **Utilities** page contains several miscellaneous tools such as System Shutdown, the Image Viewer Utility, and the iLinq Configuration Utility.

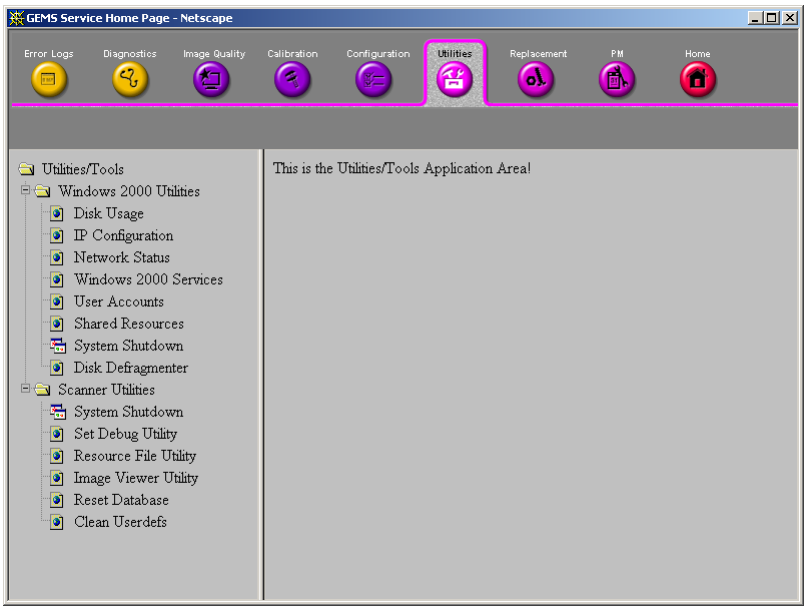


Figure 5-56 Customer Utilities Page

5-20-10 Replacement

The **Replacement** page is intended to contain the tools used to track replacement parts used in the system.

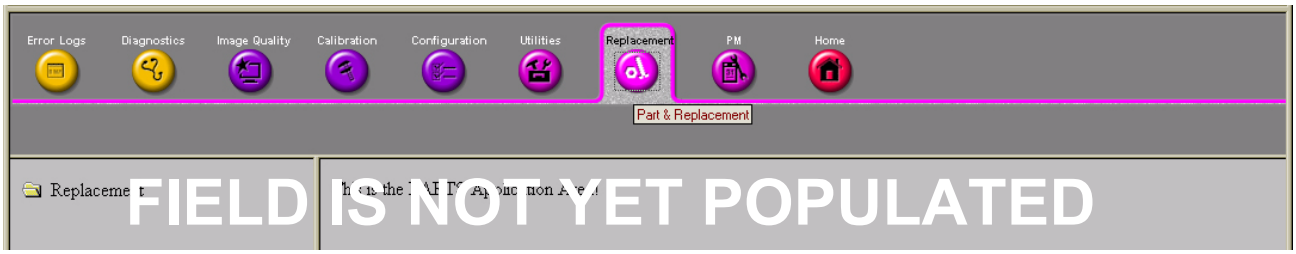


Figure 5-57 Part Replacement Page

5-20-11 PM

The **PM** page is intended to contain the tools used in periodic maintenance of the system.

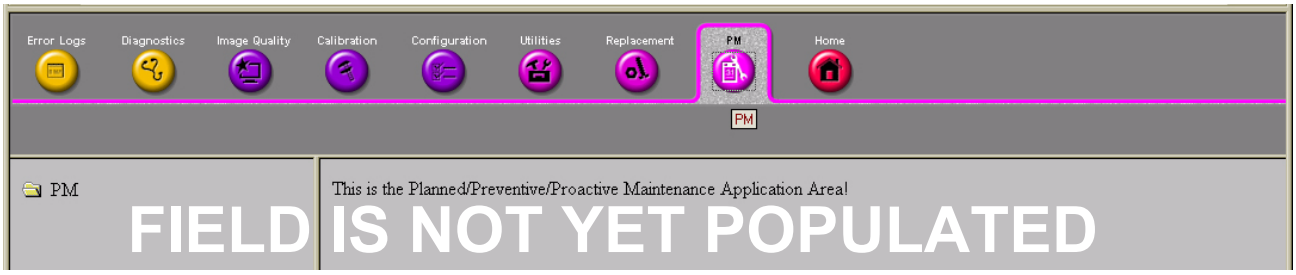


Figure 5-58 Planned Maintenance Page

Section 5-21
4D Option

Beginning with BT04 (Application Software R4.X.X) The LOGIQ™ 9 can be configured to perform 4D scans.

5-21-1 Principle of Volume Acquisition

The underlying principle for 3D volume acquisition and reconstruction is the formation of an image composed of multiple 2D scans at known elevation positions.

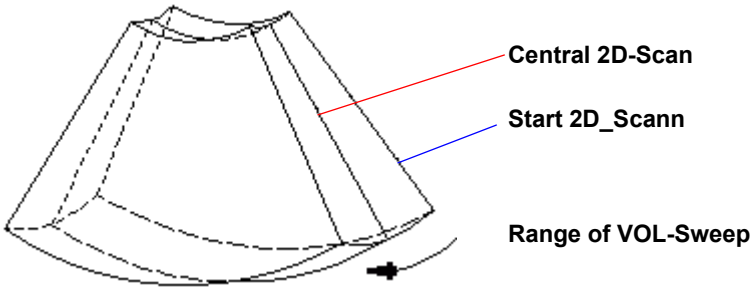


Figure 5-59 Volume Acquisition

The acquisition of volume data sets is performed by 2D scans with special transducers designed for 2D scans, 3D sweeps, and real time 4D scans. These transducers have imbedded motors that control the movement and positioning of the acoustic “stack”. The motor control box generates signals that determine the direction and speed that the stack is driven. The motor controller also generates signals sent to the Scan Control Board (routed through the internal IO) that are used for 3D image reconstruction.

NOTE: The fan on the motor control box is thermostatically controlled. Hence, the fan will only run when necessary. You should note that the fan activates after a fairly short period of use of a 3D/4D probe.

NOTE: There are no LED indicators on the motor controller to aid in determining the presence/absence of AC power to the box.

5-21-2 4D Block Diagram

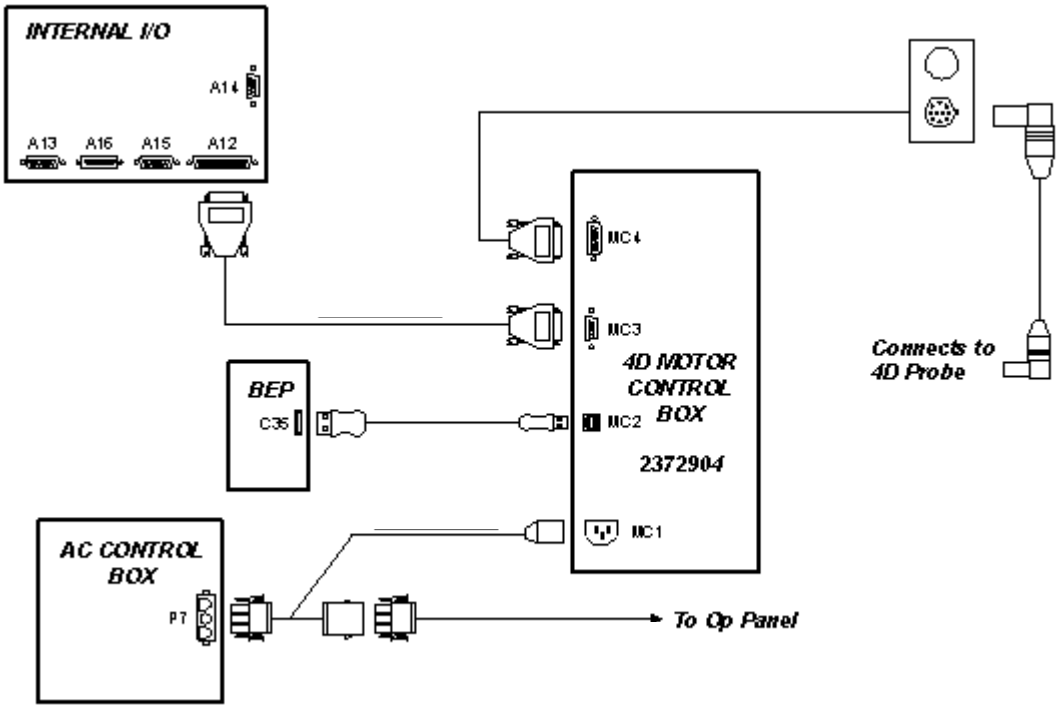


Figure 5-60 4D BLock Diagram

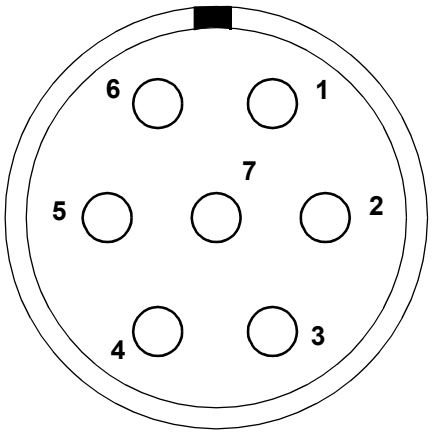
5-21-2-1 Motor Controller to Front Bracket Cable and 4D Probe Cable

The connection between the motor control box and the front bulkhead is a 15 pin sub-D (at the motor controller) and a LEMO (at the bulkhead).

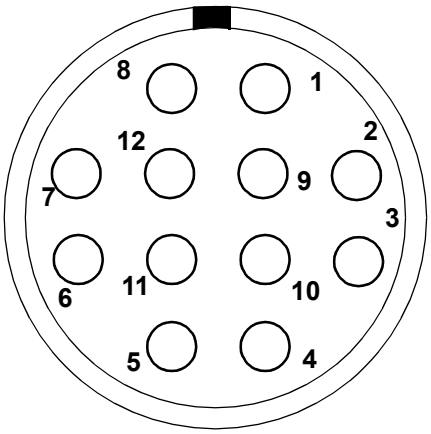
The conversion from 15 pin sub-D to 7 pin Lemo is mapped as below.

Table 5-53 Motor Controller to Bracket Cable (2375551) and 4D Probe Cable (2384183) Pin Conversions

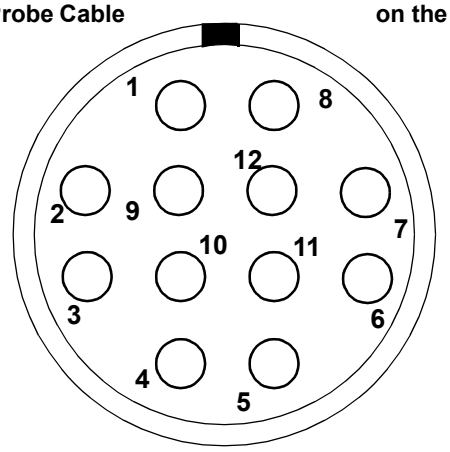
Signal	Sub D 15 Pin on MC	Lemo on L9 (12 pin)	Lemo on Probe Cable, 12 Pin	Lemo on Probe Cable, 7 Pin
GND	7	4	4	1
SIN_DRV	1	8	8	2
SIN_RTN	2	7	7	3
ACTIVE	14	2	2	4
COS_RTN	4	5	5	5
COS_DRV	3	6	6	6
HALL1	5	3	3	7



Pin Diagram of 7 pin Lemo connector on the small end of the 4D Probe Cable



Pin Diagram of 12 pin Lemo connector on the large end of the 4D Probe Cable.



Pin Diagram of 12 pin Lemo connector on the L9 for the Motor Controller to Front Bracket Cable.

Figure 5-61 Pin Diagrams

The pinout of the motor controller to the front bracket is realized via a 15 pin SUB-D female Connector (MC4) with the following pinout:

Table 5-54 15-pin SUB-D Pinout for Motor Controller to Front Bracket Cable

PIN	Signal name	In/Out	Description	Characteristics
1	SIN_DRV_1	Out	Sin1 Motor Drive Line	12 – 28 V 1,5 A rms
9				
2	SIN_RTN_1/ SIN_DRV_3	In/ Out	Sin1 Motor Return Line / Sin3 Motor Drive Line	12 – 28 V 1,5 A rms
10				
3	COS_DRV_1	Out	Cos1 Motor Drive Line	12 – 28 V 1,5 A rms
11				
4	COS_RTN_1	In	Cos1 Motor Return Line	12 – 28 V 1,5 A rms
12				
5	HALL1	In	Null puls detector	5V TTL level
13	STRA1	In	Strobo generator sign.1	5V TTL level
6	STRB1	In	Strobo generator sign.2	5V TTL level
14	ACTIVE	Out	Indicates that the Mot-Ctrl-Box is connected to the selected probe.	Pull down resistor in Mot-Ctrl_Box with 100 Ohm to GND Signal low = Mot-Ctrl-Box is connected to sel. probe
7	GND			
15	Reserved_1	IN	Reserved Input	5V TTL level
8	+ 5V	Out	Output	+ 5V low power
M1	GND		Screw of the housing	
M2	GND		Screw of the housing	

5-21-2-2 USB to Motor Controller Cable and Power Cable

The connection between the motor control box and the PC backend shall be realized with a standard USB compatible 5 pin USB female connector(MC2) with following pin out.

PIN	Signal name	In/Out	Description	Characteristics
1	VCC	IN	Power	
2	DM		Data minus	USB 2.0 Compatible
3	DP		Data plus	USB 2.0 Compatible
4	GND			
5	SHELL			

The LOGIQ 9 3D/4D motor control box also includes a power supply with connection to the L9 110 VAC power distribution (MC1).

5-21-2-3 Motor Controller to Internal I/O Cable

A 9 pin SUB-D connection to the L9 Internal IO(MC3), is made with the pin out as shown below.

PIN	Signal name	In/Out	Description	Characteristics
1	VOL_TR	Out	Sig. f. volume start	3,3V TTL level
6	FRAME_TR	Out	Sig. f. frame start	3,3V TTL level
2	DIRECTION	Out	indicate probe direction	3,3V TTL level
5	CONN_2	Out	Indicate cable connection to Mot-Ctrl-Box	Pull down resistor in mot-Ctrl_Box with 100 Ohm to GND Signal low = Mot_Ctrl_Box is connected to L9 system
7	GND			
3	GND			
8	NC		Not connected	
4	RESET	IN	RESET for Hardware	3,3V TTL level signal is low active
9	NC		Not connected	
M1	GND		Screw of the housing	
M2	GND		Screw of the housing	

Section 5-22
Continuous Wave Doppler Option

Beginning with BT04 (Application Software R4.X.X) The LOGIQ™ 9 can be configured to perform Continuous Wave (CW) Doppler scans.

The parts needed to do Continuous Wave Doppler scans include the following:

- PCI CW Doppler PWA card
- Internal CW Doppler Cable
- 5 mHz or 8 mHz probe
- Mu Metal Shield

5-22-1 Continuous Wave Doppler Signal Flow

The signal path for the CW probes is somewhat different from other LOGIQ™ 9 probes. The signal-path from the probe does not pass through the card rack, it transitions directly from the probe to the back of the BEP. The following block diagram depicts the functional elements of the PCI CW Doppler Card in the BEP.

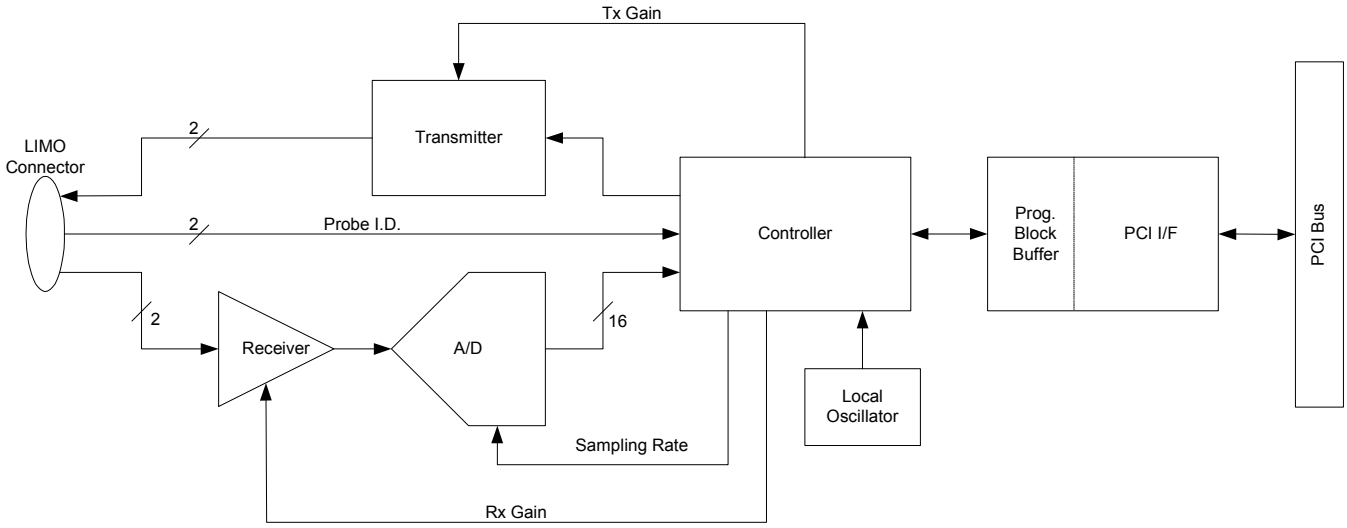


Figure 5-62 PCI CW Doppler PWA Block Diagram

In very simplified terms the PCI CW Doppler PWA card generates the CW signal and sends it out C34 on the back of the BEP. The internal CW Doppler Cable transfers the signal from the BEP to the CW Probe via a LEMO connector. The probe transmits the signal into the patient and receives the echo back. The CW Doppler Board amplifies the received signal then sends it via the PCI Interface to PCI Bus and on to the monitor.

5-22-2 PCI CW Doppler PWA card

The CW Doppler has a **local controller** that configures transmit and receive paths. The controller performs all required signal processing in order to produce 16 bit signed integer I/Q data path.

The CW Doppler **transmitter** output power is controlled in 1 Volt increments. The output power is adjustable continuously without stopping data collection.

The **receiver** gain is controlled between 0 and 100% max. gain and allows for 55 dB of gain and is programmable without stopping data collection.

The CW Doppler has a **PCI interface** that acts as a bus master. An interrupt is generated via the PCI Interface to the Host PC when the defined number of data samples has been acquired in the **Block Buffer**. The contents of the Block Buffer is DMA'd into Host PC memory.

5-22-3 Internal CW Doppler Cable

The internal CW Doppler Cable connects between the PCI CW Doppler PWA to a LEMO brand connector on the LOGIQ9 chassis. The Probe cable has the following pin assignments:

P1	J1	Conductor	Signal
1	2	Coax Center, red jacket	DOPIN
2	3	Coax shield, Red jacket.	DOPIN GND
4	5	W3	ID0
6	6	Coax center, wht jacket	PCW
5	7	Coax shield, Wht jacket.	PCW GND
3	8	W5	ID1
	10	W1,W2 shield	
Shell	HW1	W1,W2 shield	

5-22-4 Probe Connector

The two probes connect to the system via a LEMO connector: FFA.3S.310.CLAC11. with pin connections per table 1-3. A Resistor, R1, shall be installed as an identifier for the probe type:

5 MHz - 75 K ohm

8 MHz – 25 K ohm

Table 5-55

Lemo	Conductor	Signal
2	Coax Center, red jacket	DOPIN
3	Coax shield, Red jacket.	DOPIN GND
5	R1-2	ID0
6	Coax center, wht jacket	PCW
7	Coax shield, Wht jacket.	PCW GND
8	R1-1	ID1
10	Outer shield	
Shell	Outer shield	

5-22-5 Mu Metal Shield

Mu metal shield is used to block flux field from the L9 isolation transformer mounted below the BEP.

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Chapter 6
Service Adjustments

Section 6-1
Overview

6-1-1 Purpose of Chapter 6

This chapter describes how to test and adjust the mechanical capabilities of a scanner that may be out of specification. Although some tests may be optional they should only be performed by qualified personnel.

Table 6-1 Chapter 6 Contents

Section	Description	Page Number
6-1	Overview	6-1
6-2	Regulatory	6-1
6-3	Monitor	6-2
6-4	Panel Calibration	6-5
6-5	Z-Release Cable and Gas Spring Adjustment	6-6
6-6	Brake Arm Adjustment	6-11
6-7	Brake Adjustment	6-13

CAUTION **SYSTEM REQUIRES ALL COVERS**
Operate this unit only when all board covers and frame panels are securely in place. The covers are required for safe operation, good system performance and cooling purposes.

NOTICE Energy Control and Power Lockout for LOGIQ™ 9



When servicing parts of the system where there is exposure to voltage greater than 30 Volts:
Unplug the system
Maintain control of the system power plug
There are no test points to verify isolation, you must wait for at least 20 seconds for capacitors to discharge

Beware that the AC Control Box, Front End Processor and Back End Processor may be energized even if the power is turned off when the cord is still plugged into the AC Outlet.

Section 6-2
Regulatory

Verify, where applicable, that any regulatory information or tests required by national law are present and accounted for, and any regulatory tests required by national law are performed *and* documented.

Section 6-3
Monitor

6-3-1 Monitor Adjustment

Contrast, brightness and degauss are adjusted using the three (3) keys located on the front of the monitor just below the screen.

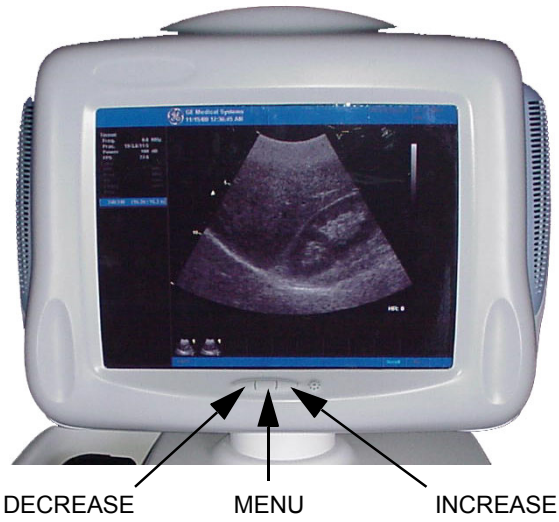


Figure 6-1 Monitor Adjustment Switches

6-3-1-1 Degauss

By pressing either the increase button or decrease button the degauss menu appears. Pressing the menu button will degauss the monitor. If you do not wish to degauss the monitor, again press either the decrease button or increase button and the monitor will return to the default screen.

6-3-1-2 Brightness and Contrast

To calibrate brightness and contrast, go to Utility > Test Patterns > Brightness Calibration. The screen display will change as shown in Figure 6-2 on page 6-3 .

Section 6-3 Monitor (cont'd)

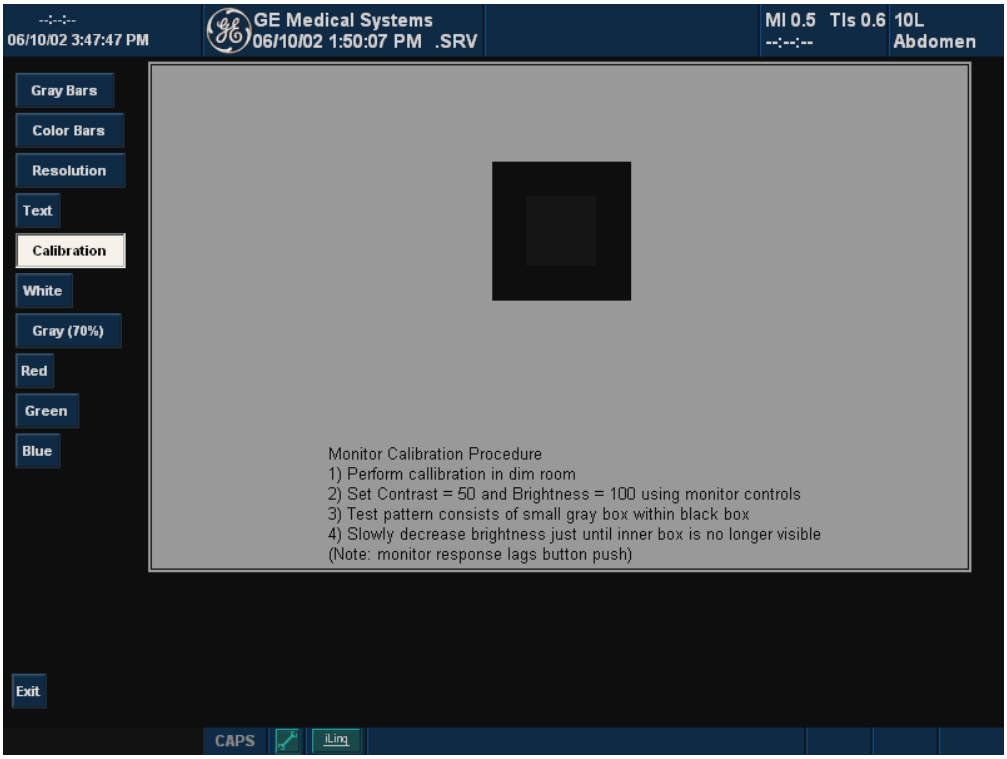


Figure 6-2 Monitor Brightness/Contrast Calibration Test Pattern

Follow the instructions on the screen. Press the menu button (middle) to adjust the Contrast to 50. Press the menu button again and adjust the Brightness to 100. Decrease the Brightness setting until the inner gray is the same shade as the black box that surrounds it. This brightness setting should range between 35 to 55.

Final adjustment relies on customer approval. Cameras and printers may need to be adjusted to match any monitor changes.

6-3-1-3 Visible Image Display Adjustment

If you get a monitor where the image is smaller than the physical CRT displayed area, in other words the image does not fill the screen, you can adjust the size of the visible image display following this procedure:

1.) Press and HOLD the center button "brightness/contrast (icons)" for about 10 seconds or so, you'll then see an expanded menu. This will allow you to adjust parameters like Color, Size/Center, Geometry, etc. and Utility.

NOTE: It is recommended that only the image size be adjusted as required and not anything else.

2.) Press the Left or Right Arrow buttons to highlight Size/Center then Press the Center button.
3.) Use the Center button to select H-Position, H-Size, V-Position or V-Size.
4.) Use the Left or Right Arrows to adjust H-Position, H-Size, V-Position or V-Size parameters.
5.) When complete use the Center button to select Exit and press the Left or Right arrow buttons
6.) Use the Left or Right Arrow buttons to select Exit and press the Center button to exit the main menu.

6-3-2 Monitor Tilt

The monitor is capable of a full 10° forward and backward tilt. Although the default setting of the tilt tension on the monitor should be adequate to tilt the monitor for your viewing preference, it can be easily adjusted.

The monitor chassis is attached to the monitor mount plate that has a shaft that inserts into the top plate of the scanner. This feature allows the monitor to swivel without need for adjustment.

The monitor mount plate has two points for adjustment.

6-3-2-1 Monitor Tilt Adjustment Procedure

Passing through the monitor mount plate on its underside is a large bolt, with a locking nut on its left side, that provides the tension for monitor tilt. Adjust the tilt tension by loosening or tightening the locking nut on this bolt.

NOTE: The right side of this bolt will receive an Allen wrench to provide resistance when loosening and tightening the locking nut.

6-3-2-2 Monitor Counter-balance Adjustment Procedure

At the back of the monitor mount plate is a nut securing a bolt passing through the shaft. This bolt has a tapered end and several spring washers that when seated into the cylinder provides a proper counter-balance for the monitor.

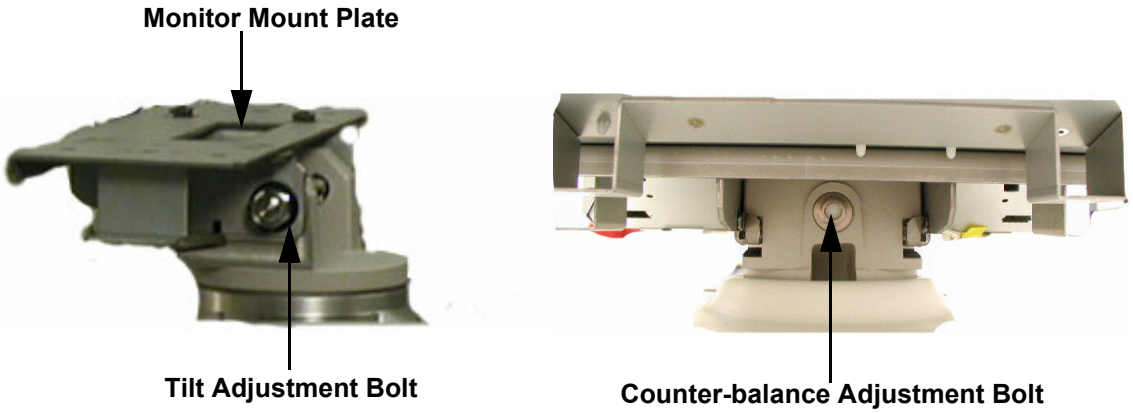


Figure 6-3 Monitor Tilt Tension Adjustment

6-3-2-3 Tools

Phillips screwdriver

Open-ended wrenches

6-3-2-4 Manpower

1 person, 1 hour + travel or

2 people, 1 hour + travel if the monitor needs to be removed.

6-3-2-5 Procedure

1.) Raise the Control Panel to a height that allows you to work underneath the monitor.
2.) Remove the eight (8) Phillips screws holding the Under Shelf Cover to the Shelf Cover Assembly.
3.) Remove four (4) Phillips screws holding the monitor Rear Cover Assembly to the monitor chassis.
4.) You now have access the monitor tilt and counter-balance adjustments. Adjust accordingly.
5.) Install the monitor rear cover assembly to the monitor chassis.
6.) Position the shelf cover assembly and secure it in place with the Under Shelf Cover and the eight Phillips screws.

Section 6-4
Panel Calibration

The Touch Panel Adjustment/Calibration procedure can be found in Section 7-6-1-1 *"Calibration Utilities" on page 7-16*.

Section 6-5
Z-Release Cable and Gas Spring Adjustment

The operator panel can move up and down (Z direction). A gas spring in the scanner provides a counter force to "balance" the weight of the operator panel and allows for positioning with minimal effort. A lever on the main handle has a cable (similar to a bicycle cable) that provides the release for the gas spring. This cable has one end attached to the release lever and the other end attached to the mechanism on the gas spring piston.

6-5-1 Time Required

Approximately 1 person for 1 hour plus travel.

6-5-2 Tools

Phillips screwdriver

10mm open-end wrench

Two (2) small slotted screwdrivers

Needle-nose pliers

Small ruler

Large slotted screwdriver

3mm Allen wrench

6-5-3 Preparations

⚠ **DANGER** **DANGEROUS VOLTAGES ARE PRESENT IN THIS EQUIPMENT. COMPLETELY POWER OFF AND SHUTDOWN THE SCANNER BEFORE SERVICING.**

1.) Power Off / Shutdown the scanner.

6-5-4 Z-Release Cable Adjustment

CAUTION **Before making any adjustments, check the Z-release system to determine what adjustments need to be made.**

6-5-4-1 Checking the Release System

1.) Squeeze the Z-release lever and move the operator panel to its highest position. If this is not possible, perform the necessary steps in Emergency Release Procedure on page 6-10.

2.) Place a small ruler next to the Z-release lever as shown in the Figure 6-4 below.

3.) Gently wiggle the Z-release lever and measure the amount of play in the lever.

4.) If this amount is 3mm or more, there is too much play in the cable. Perform the steps in the section Z-Release Cable Adjustment on page 6-7 to reduce the amount of play in the cable.

5.) Attempt to lower the operator panel by pushing down on it. The operator panel should not move. While continuing to push down, slowly squeeze the Z-release lever.

6.) Note the position of the Z-release lever when the operator panel starts to move. It should be 1/4 to 2/3 of the lever's range of motion.

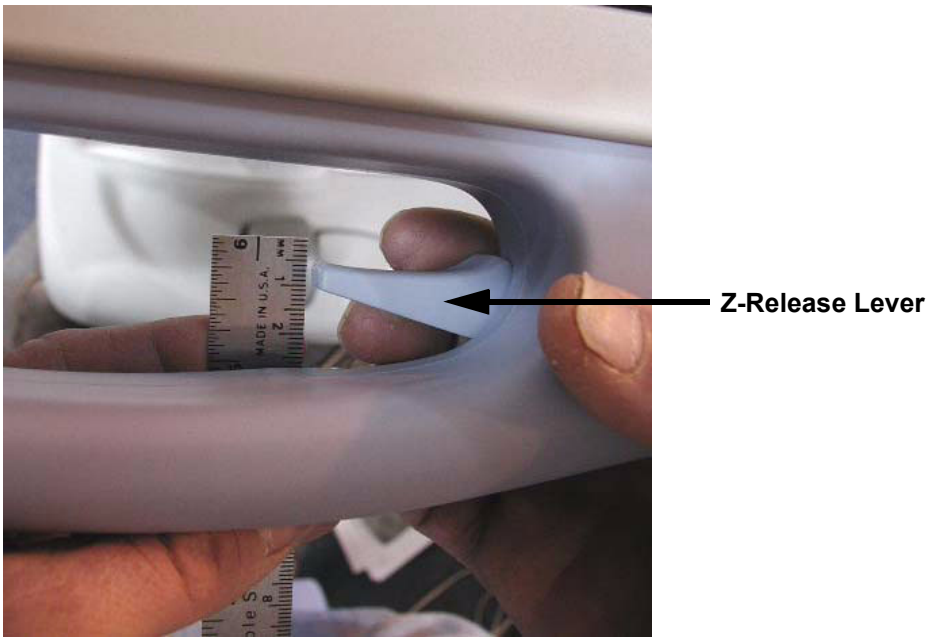


Figure 6-4 Z-Release Measurement

6-5-4-2 Cable Adjustment

1.) From underneath the handle use a 10mm open-end (small “ignition” style) wrench to screw **in** the cable adjustment screw to tighten the Z-release cable.

2.) If you cannot remove enough of the play in the cable using this adjustment, see Cable Adjustment at Gas Spring on page 6-8

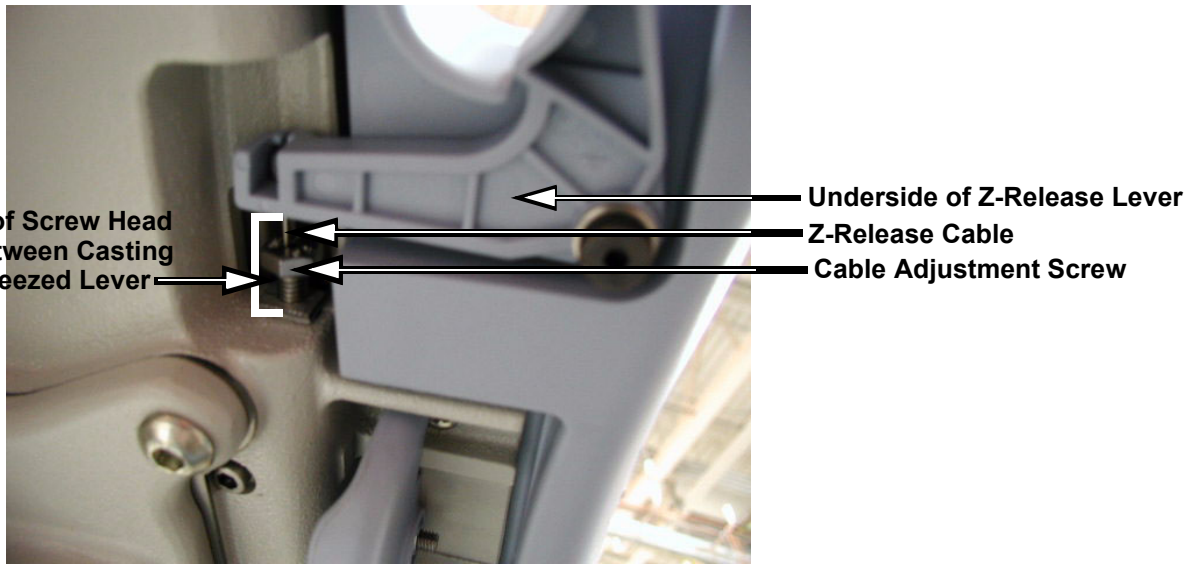

Underside of Screw Head Halfway Between Casting and Un-squeezed Lever
Underside of Z-Release Lever
Z-Release Cable
Cable Adjustment Screw

Figure 6-5 Z-Release Cable Adjustment Screw

6-5-5 Cable Adjustment at Gas Spring

6-5-5-1 Preparations

1.) If not already performed, Power Off / Shutdown the scanner.

2.) Remove the right- and left-side covers of the scanner .

3.) Remove the front cover of the scanner .

4.) Remove the black-and-white printer.

5.) Remove the VCR.

NOTE: The height of the printer and VCR make them difficult to remove without first removing the front cover.

6-5-5-2 Procedure

NOTE: The operator panel must be at or near its highest position.

1.) From underneath the handle use a 10mm open-end (small “ignition” style) wrench to screw **out** the cable adjustment screw so the underside of the screw head is about half way between the casting and the unsqueezed lever. See Figure 6-5 on page 6-8 .

2.) There is a Wire Clamp nestled in the Forked Retainer. Refer to Figure 6-6. Using 2 slotted screwdrivers (one on each side of the clamp) loosen the clamp.

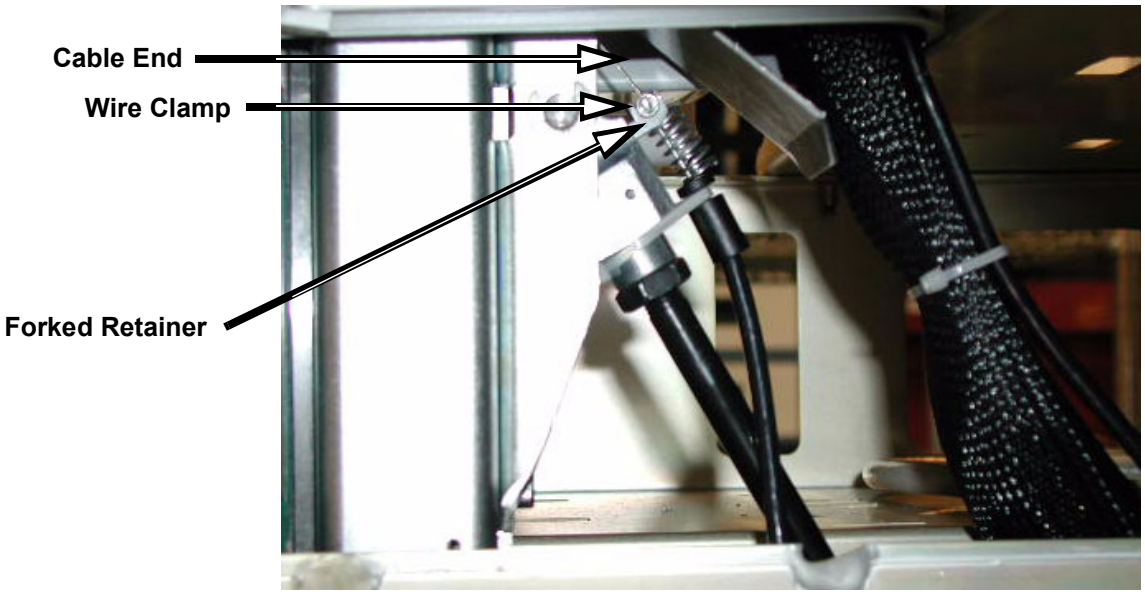


Figure 6-6 Gas Spring Mechanism

3.) Using needle nose pliers, hold the cable end which is above the clamp and pull upward to take up any cable slack.

4.) Using one of the two slotted screwdrivers, push the Clamp down along the cable so that it is nestled back in the Forked Retainer.

⚠ **WARNING** ***Do NOT attempt to pinch together or pry apart the forked retainer. If one of the tines should break off, the gas spring piston may have to be replaced at the factory.***

5.) Tighten the clamp with one screwdriver to hold the cable. Let go of the pliers and then use the two screwdrivers to fully tighten the clamp.

6.) Without squeezing the release lever, check that the forked retainer is in its fully up position.

7.) Squeeze the release lever and watch the forked retainer move down immediately as the lever is squeezed, there should be very little play in the cable. Small amounts of play can be taken up (or slackened) with the cable adjustment screw per step 1.

6-5-6 Emergency Release Procedure

When the operator panel is at or near its highest position it is possible to see the gas spring mechanism with the Black and White Printer or the VCR removed. If the operator panel is stuck in the down position, it is not possible to see the gas spring mechanism as it is down behind the card rack. To avoid removing the Card Rack to make adjustments, try this procedure to raise the operator panel.

1.) Using 3mm Allen Wrench, remove the shoulder bolt holding the release lever on the handle.

2.) Tilt the release lever down and pull on the cable as shown in the figure below. This will give unlimited travel and hopefully release the gas spring. Push up on the operator panel while you are pulling on the cable.

⚠ **CAUTION** **Do NOT use excessive force!**



Figure 6-7 Release Lever

3.) If you have no cable to pull (cable broken) or you are unable to release the gas spring in this manner, you must remove the Card Rack to gain access to the gas spring mechanism.

6-5-7 Procedure Completion

1.) Install the VCR.

2.) Install the Black-and-White printer.

3.) Replace the front cover .

4.) Replace the side covers.

5.) If required, Power On / Bootup the scanner.

Section 6-6
Brake Arm Adjustment

Adjustments to the brake arm may be necessary if the pedals do not depress readily nor engage so the front wheels lock in place and do not swivel.

6-6-1 Tools

Flat-head screwdriver

6-6-2 Manpower

One person, 1 hour + travel

6-6-3 Preparations

1.) Remove the front bumper.

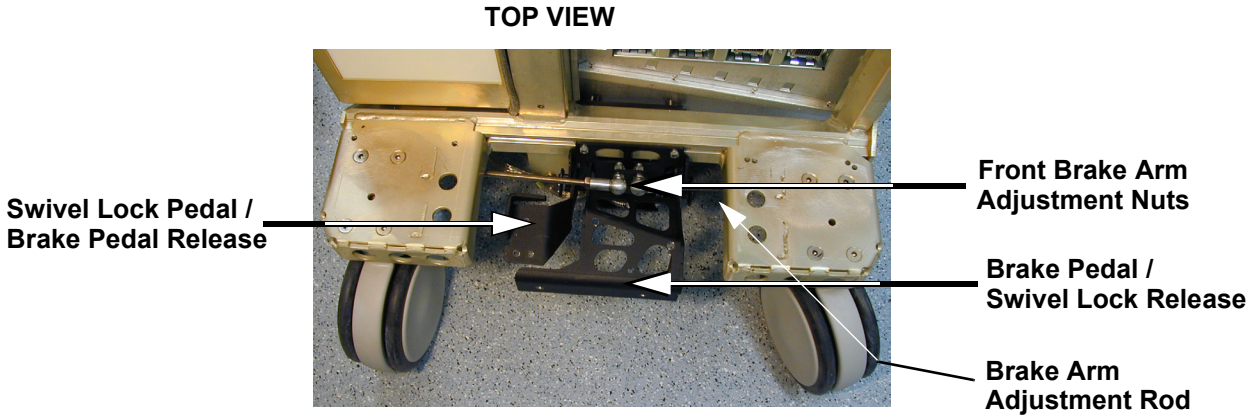

TOP VIEW
Swivel Lock Pedal / Brake Pedal Release
Front Brake Arm Adjustment Nuts
Brake Pedal / Swivel Lock Release
Brake Arm Adjustment Rod

Figure 6-8 Brake Adjustment

6-6-4 Brake Arm Adjustment Procedure

To adjust the brake arm it is recommended to separate both front adjustment nuts from the brake assembly.

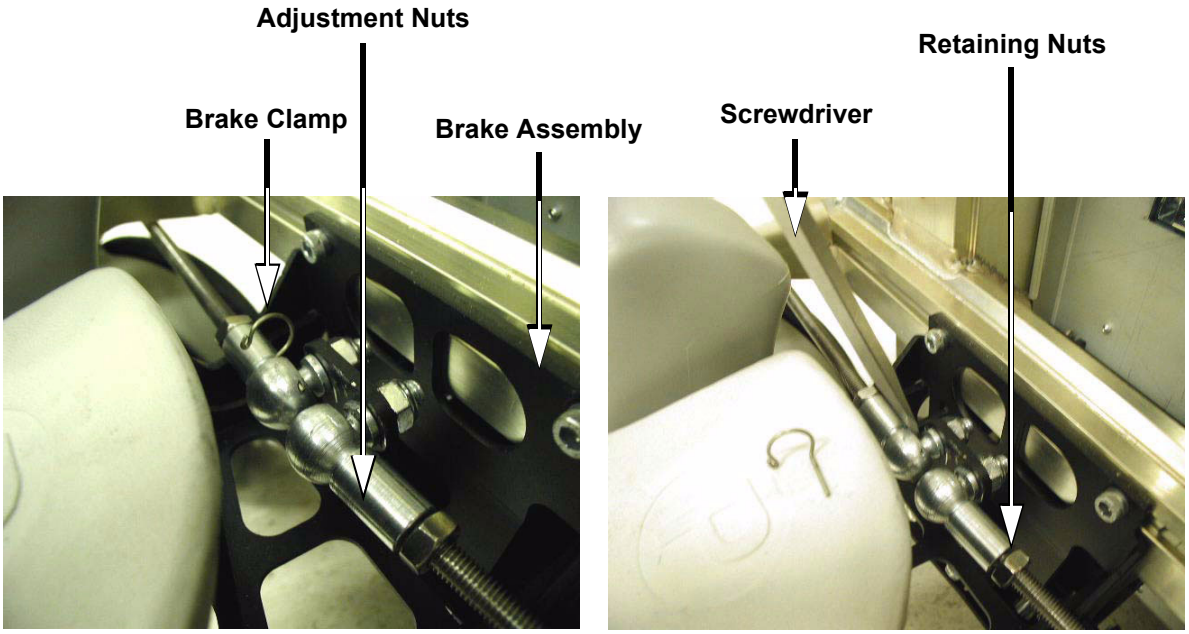


Figure 6-9 Front Adjustment Hardware

2.) Remove the brake clamps that are inserted through a small hole in the front adjustment nuts and slipped over the nut at its collar.

3.) Loosen the front retaining nuts to allow room for adjustments.

4.) With a screwdriver you can pry the front adjustment nuts away from their connectors in the brake assembly.

5.) Set the main brake - the brake assembly should be pulled to the left.

6.) Seat the right adjustment rod into the right adjustment nut under the right front wheel as far as it will go.

7.) Seat the right front adjustment nut onto the adjustment rod as far as it will go.

8.) In order to insure that the same length of adjustment rod is seated into the two adjustment nuts you will turn the adjustment rod one turn out of the rear adjustment nut under the front wheel and turn the front adjustment nut off the adjustment rod a similar turn.

9.) Repeat this alternating rotation until the front adjustment nut lines up easily with the connector in the brake assembly.

10.) Push the adjustment nut onto the brake assembly connector and secure the retaining nut tight against the adjustment nut.

NOTE: Repeat the same procedure to adjust the swivel lock. The only difference would be to set the swivel lock prior to the adjustments.

6-6-5 Procedure Completion

1.) Install the front bumper.

Section 6-7
Brake Adjustment

6-7-1 Front Wheel Brakes

Service adjustment to the front brakes involve setting the brake so it will properly “bite” the rear tire. The default setting should provide proper braking. If not, follow the procedures below.

6-7-1-1 Tools

Allen Wrenches

6-7-1-2 Manpower

One person, 1 hour + travel

6-7-1-3 Preparations

1.) Set the rear brakes to prevent the scanner from rolling.
2.) Remove the front bumper.

6-7-1-4 Front Brake Adjustment Procedure

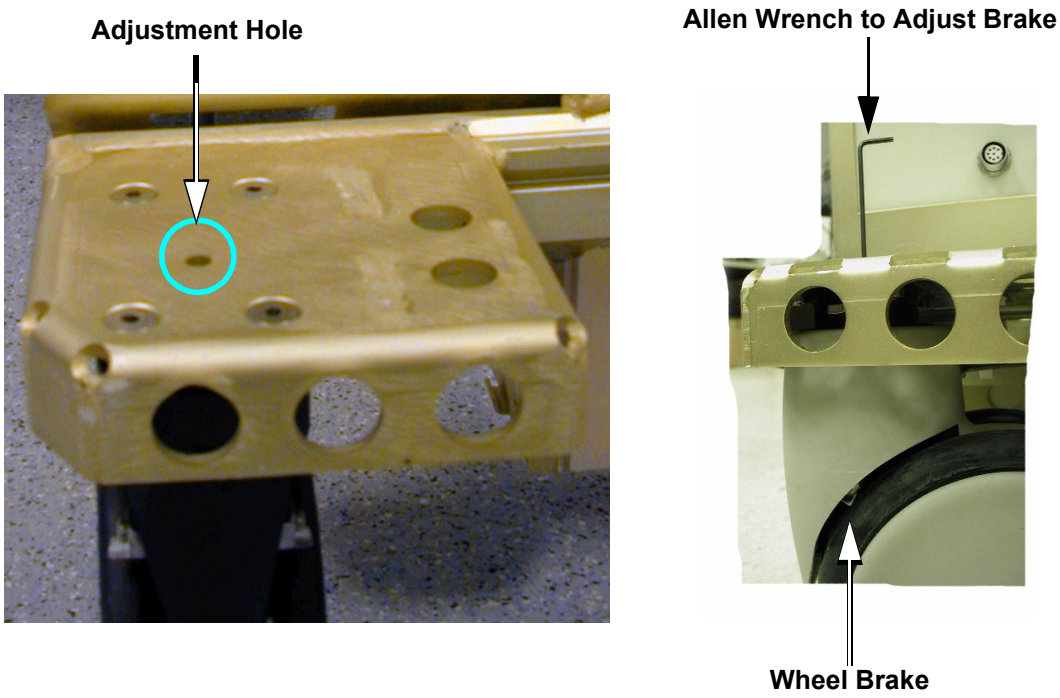


Figure 6-10 Front Brake Adjustment

1.) Refer to Figure 6-10. Use the Allen wrench to add more pressure in order to get more braking action.
2.) If the brakes are too tight, loosen the adjustment with the Allen wrench.
3.) Check the brakes and readjust as necessary before replacing the front bumper.

6-7-2 Rear Wheel Brakes Adjustment

Service adjustment to the rear brakes involves setting the brake so it will properly “bite” the rear tire. The default setting should provide proper braking. If not, follow the procedures below to remove the rear wheel and adjust the brake.

⚠ **WARNING** ***PRIOR TO ELEVATING SCANNER, VERIFY THAT THE FLOATING KEYBOARD IS LOCKED IN ITS LOWEST POSITION. VERIFY THAT THE FRONT BRAKE IS LOCKED AND THE SCANNER IS UNABLE TO SWIVEL. VERIFY THAT THE REAR BRAKES ARE IN THE LOCKED POSITION.***

⚠ **WARNING** ***USE EXTREME CAUTION WHEN ELEVATING SCANNER. ELEVATING SCANNER WILL MAKE IT UNSTABLE WHICH COULD CAUSE THE SCANNER TO TIP OVER.***

6-7-2-1 Tools

Bottle Jack
Allen Wrenches

6-7-2-2 Manpower

One person, 1 hour + travel

6-7-2-3 Preparations

1.) Remove the left- and right-side covers.
2.) Remove the upper rear cover.
3.) Remove the lower rear cover.

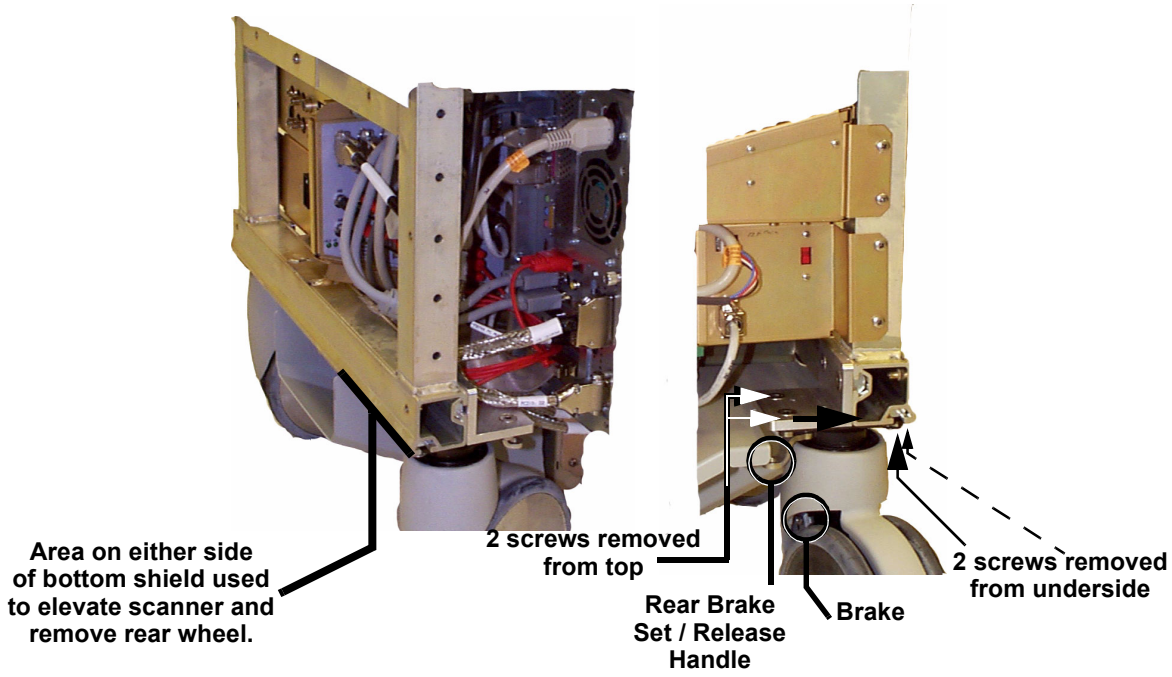

Area on either side of bottom shield used to elevate scanner and remove rear wheel.
2 screws removed from top
Rear Brake Set / Release Handle
Brake
2 screws removed from underside

Figure 6-11 Rear Brake Adjustment

6-7-2-4 Rear Wheel Removal Procedure

4.) Elevate the scanner by placing the bottle jack on the back frame on the side of the bottom shield of

the wheel you will be removing. You can also use a block of wood as a lever to raise the scanner and place a second block of wood under the chassis to support the rear wheel off of the ground.

5.) Remove the four screws and remove the wheel from the scanner.

6.) Use an allen wrench to adjust the brake so it will properly “bite” and release the rear tire.

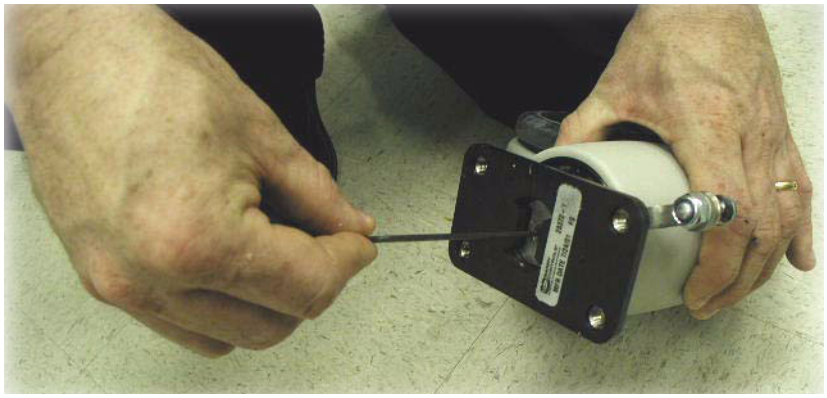


Figure 6-12 Rear Brake Adjustment

6-7-2-5 Rear Wheel Installation Procedure

1.) After adjusting the rear brake, install the rear wheel on the scanner. Hand tighten the four screws.

2.) Carefully lower the scanner and remove the bottle jack.

3.) Tighten the four screws using the weight of the scanner to provide resistance.

4.) Verify brake and scanner operation then replace all covers previously removed.

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Chapter 7
Diagnostics/Troubleshooting

Section 7-1
Overview

7-1-1 Purpose of Chapter 7

This section describes how to setup and run the tools and software that help maintain image quality and system operation. Basic host, system, and board level diagnostics are run whenever power is applied. Some Service Tools may be run at the application level.

Table 7-1 Contents in Chapter 7

Section	Description	Page Number
7-1	Overview	7-1
7-2	Gathering Trouble Data	7-2
7-3	Screen Captures	7-5
7-4	Virtual Console Observation	7-10
7-5	Diagnostics	7-12
7-6	Acquisition Diagnostics	7-13
7-7	I/O Devices	7-17
7-8	Common Diagnostics	7-22
7-9	Utilities	7-25

Section 7-2
Gathering Trouble Data

7-2-1 Overview

There may be a time when it would be advantageous to capture trouble images and system data (logs) for acquisition through remote diagnostics (InSite) or to be sent back to the manufacturer for analysis. There are different options to acquire this data that would give different results.

7-2-2 Collect Vital System Information

The following information is necessary in order to properly analyze data or images being reported as a malfunction or being returned to the manufacturer:

- Product Name = LOGIQ™ 9

From the *Utility>System>About* screen:

Applications Software

- Software Version
- Software Part Number

System Base Image Software

- Base Image Revision
- Image Part Number

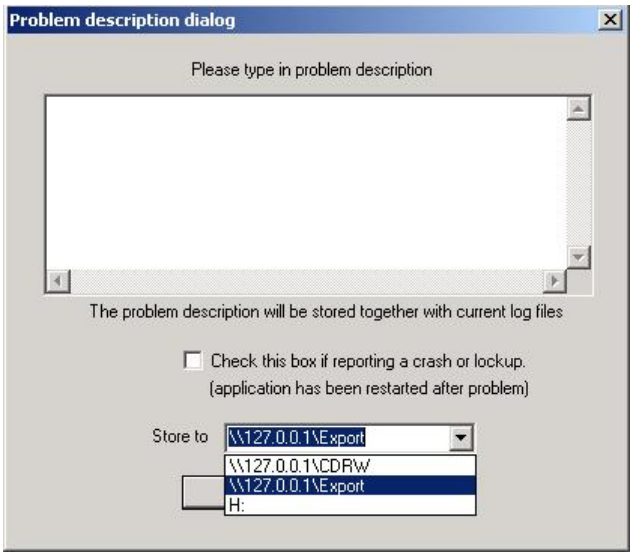
7-2-3 Collect a Trouble Image with Logs

If the system should malfunction, press the Alt-D keys simultaneously. This will collect a screen capture of the image monitor, user-defined presets, and the following logs:

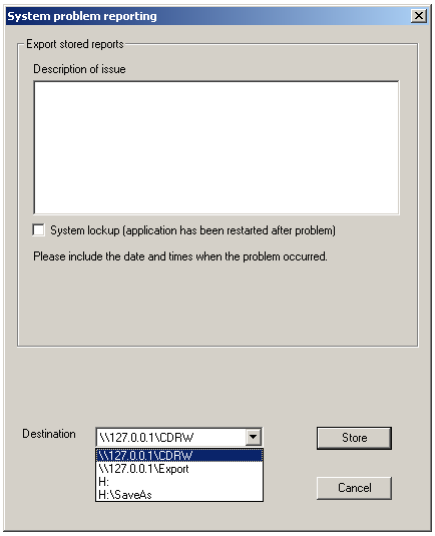
- - Keyboard Shadow Log
- - Error Logs
- - Crash Log
- - Vital Product Data
- - Network Sniffer Logs (Beginning with R3.x.x S/W)
- - Windows Event Logs (Beginning with R4.x.x S/W)
- - Windows Modem Log (Beginning with R4.x.x S/W)
- - Diagnostic Logs (Beginning with R4.x.x S/W)
- - Service Logs (Beginning with R4.x.x S/W)

NOTE: Power Supply and Temperature logs are not currently being updated by the LOGIQ™ 9.

This Alt-D function is available at all times.


Problem description dialog
Please type in problem description
The problem description will be stored together with current log files
Check this box if reporting a crash or lockup.
(application has been restarted after problem)
Store to
\\127.0.0.1\Export
\\127.0.0.1\CDRW
\\127.0.0.1\Export
H:

Example of R2.x.x screen



Example of R3.x.x or R4.x.x screen

Figure 7-1 ALT-D Dialog Box

When Alt-D is pressed, a menu box appears that allows for:

- A place to enter a description of the problem. This description should include at a minimum:
  - * Date
  - * Time
  - * Actions performed right before the crash
  - * Active modes
  - * Active probes
- A choice to store to a pre-formatted MOD (H: drive), CD-RW, USB memory stick, or to the *Export* directory D: drive (for remote viewing through InSite).

NOTE: The USB memory stick option is only available in R4.0.x and after. To save to a USB memory stick you must insert the stick in the lower front of the console , prior to starting Alt-D, then the memory stick will appear as a destination. Do not attach the memory stick in the Wired Microphone port on the control panel.

*NOTE: You **MUST** select H: or CD-RW as the destination device, otherwise the data is written to the default Export directory on the hard drive. The EXPORT directory is only used for InSite. It is not intended for FEs or Customer use; therefore, choose the H: drive which is the MOD or choose the CD-RW.*

NOTE: NOTE: If writing to a CD be sure that it is preformatted.

The subsequent file is compressed and time stamped. The screen capture is a bitmap which eliminates the possibility of artifacts from compression.

Double check the CD or MOD that you made to ensure it contains at least two files. An example is shown in Figure 7-2.

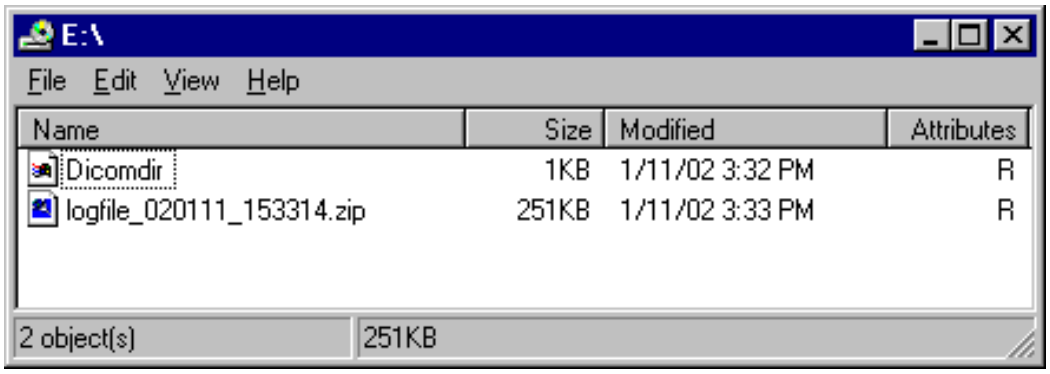


Figure 7-2 Example of Zipped Trouble Image & Logs File

Section 7-3
Screen Captures

There may be times when the customer or field engineer will want to capture a presentation on the screen so it may be recovered by the OnLine Center through InSite. This is accomplished by first saving the image(s) to the clipboard using a Print Key.

The P4 key is the factory default print key to accomplish a secondary screen capture. However, the default is for the video area only or the customer may have customized the P4 Key function. Therefore, screen capture should involve the following steps:

1.) Check and record any custom settings for the Print4 button.
2.) Set the Print4 button to Whole Screen, Secondary Capture.
3.) Capture the required screens to the Hard Drive, MOD, CD-R, DVD-R or USB Memory Stick.
4.) Restore the Print4 button to it's original settings.

7-3-1 Check and Record the P4 Key Function

Check the function of the Print 4 Key in the event that the customer may have made some custom settings.

1.) Select *Utility* from the Touch Panel.
2.) Select *Connectivity* from the Utilities Menu.
3.) Select the *Buttons* tab on the Connectivity screen.
4.) In the *Button* field, select Print4.

The Connectivity/Buttons Screen will be displayed like the one shown in Figure 7-3 on page 7-5 .

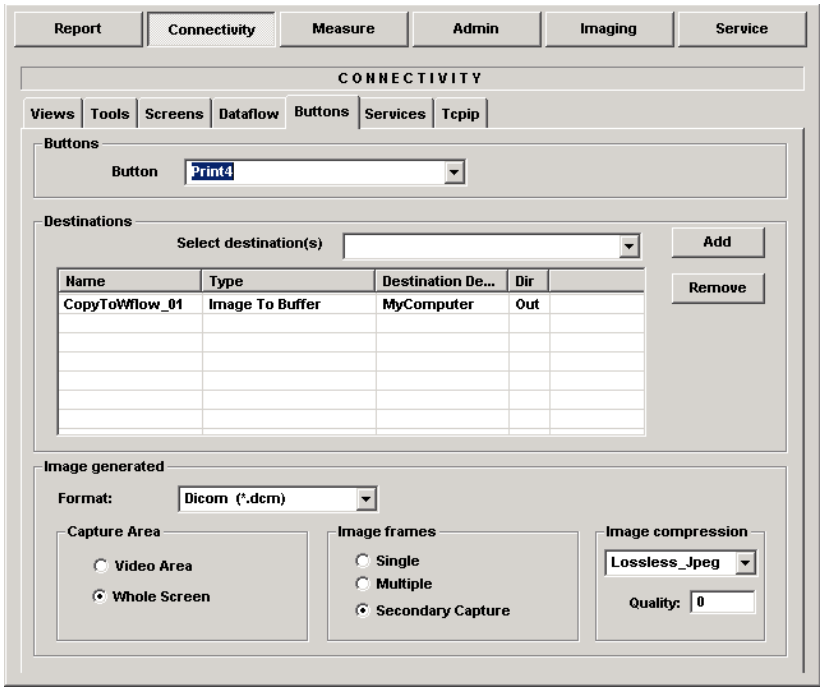


Figure 7-3 Buttons Set Up Screen

7-3-1 Check and Record the P4 Key Function (cont'd)

P4 is the factory default Screen Capture Key. If it is not set to Whole Screen or Screen Capture, as shown in Figure 7-3, proceed to step 5 to record the customer's custom settings.

5.) In the *Destinations* section, record the service that is displayed. The destinations list displays the following information:
   * Name: user defined during service configuration
   * Type: the type of service
   * Server: the device for which the service was configured
   * Dir: direction: output, input, or both (I+O)

6.) In the *Image generated* section, record the parameters related to the service.

7-3-2 Setting the P4 Key to Screen Capture

If the P4 Key is not set to screen capture:

1.) While on the Connectivity screen, with the Buttons tab displayed, go to the drop down selection menu in the *Destinations* section.

2.) From the drop down menu select *CopyToWflow_01>Image to Buffer>MyComputer>Out*.

3.) Ensure that the *Image generated* section for capture Area is set to Whole Screen, secondary Capture and No Image Compression.

4.) The P4 Key should now be set up for whole screen capture, sending the screens to the image buffer (clipboard).

7-3-3 Capturing a Screen

The following is a generic process to capture any screen from the scanner:

1.) Navigate to and display the image/screen to be captured.

2.) Press **P4**. This will place a snapshot of the screen on the "clipboard" displayed at the bottom of the scan image display.

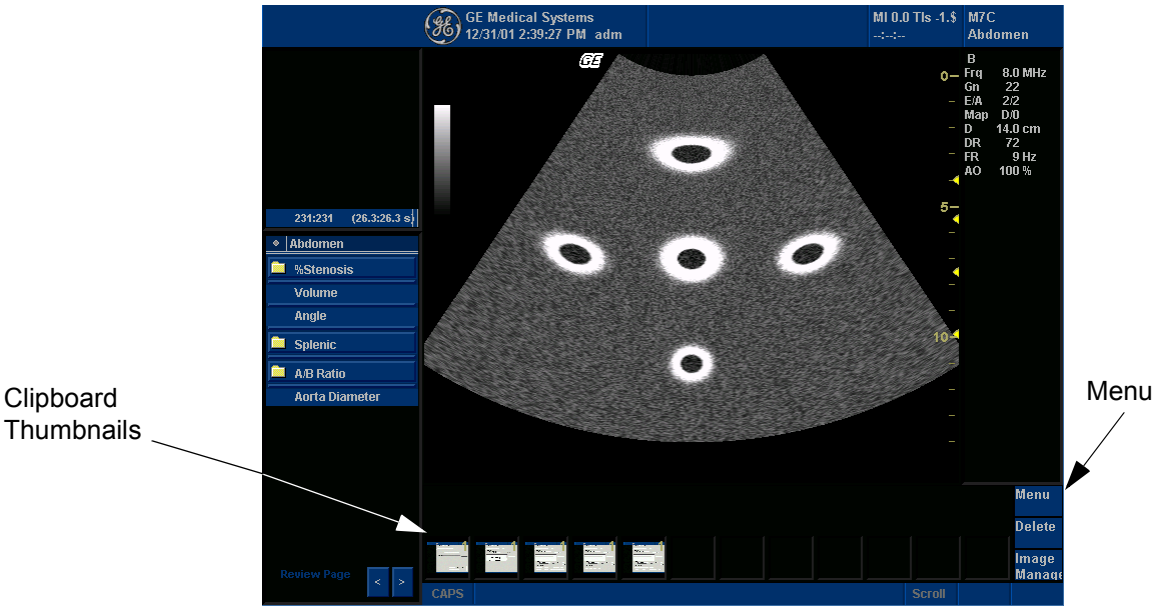


Figure 7-4 Select Image to Capture

3.) Select SCAN from the touch panel to view the image screen and the snapshots displayed on the bottom.

4.) Highlight the snapshot to be stored to the system hard drive, MOD or CD-R.

5.) Select Menu on the right side of the image screen, then highlight and select SAVE AS.



Figure 7-5 Menu > Save As

7-3-3 Capturing a Screen (cont'd)

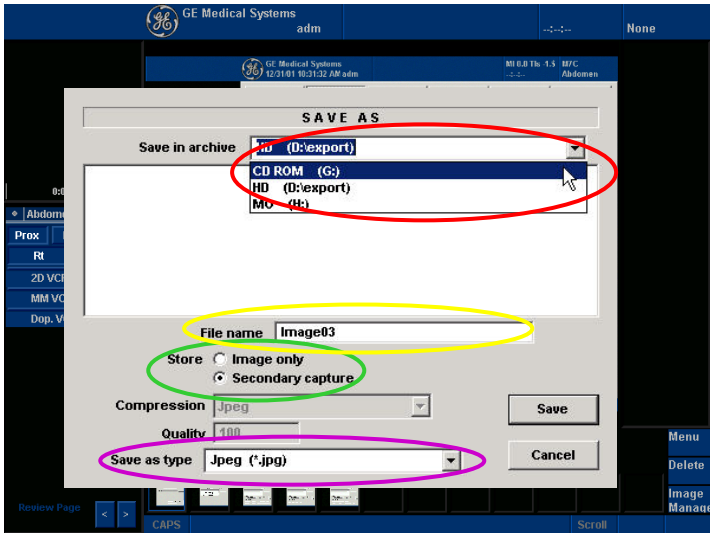


Figure 7-6 Save Dialog Box

6.) A Save dialog box will be opened. Choose *d:\export folder* as the archive location to save the image on the hard disk, MOD or CD-R.

7-3-4 Reset the P4 Key to Customer's Functionality

If the customer had programmed the P4 Key to a function other than screen capture, restore that functionality recorded in 7-3-1 on page 7-5. Refer to Figure 7-3.

1.) Select *Utility* from the Touch Panel.
2.) Select *Connectivity* from the Utilities Menu.
3.) Select the *Buttons* tab on the Connectivity screen.
4.) In the *Button* field, select Print4.
5.) In the *Destinations* section, select the service(s) recorded in step 5, Section 7-3-1. The destinations list displays the following information:
    * Name: user defined during service configuration
    * Type: the type of service
    * Server: the device for which the service was configured
    * Dir: direction: output, input, or both (I+O)

NOTE: Only output services can be associated to the print keys.

6.) In the *Image generated* section, select the parameters related to the service recorded in step 6, Section 7-3-1.

7-3-5 Ctrl-PrintScreen Shortcut

Starting with R4.x.x software, a Ctrl-PrintScreen shortcut is available for quickly capturing the image displayed on the system. Images captured using this shortcut are saved in the D:\export directory using both the JPEG (.jpg) and raw DICOM (.dcm) formats.

Section 7-4
Virtual Console Observation

7-4-1 General

This tool offers the possibility to view the entire customer's desktop and operation system.

Using VCO the Online Center (OLC) can access and modify all scanner settings and programs on the customer's ultrasound scanner.

The customer has to enable this feature by choosing "Disruptive Mode" and confirming "Yes", before a GE Service FE can access the customer's ultrasound scanner remotely. "Disruptive Mode" can be requested remotely by the OLC, or it can be selected by the customer directly on the scanner or workstation.

1.)

7-4-2 How Customer Enables Disruptive Mode

The steps a **customer** has to take to enable Disruptive Mode are:

1.) Click on the Service Browser wrench icon in the application's status bar at the bottom of the ultrasound display. This icon links the User or Field Engineer (FE) to the Service Login screen shown in Figure 7-8 on page 7-10 .

NOTE: The screen in Figure 7-8 is an example from a LOGIQ™ 9 Engineering system. The System Type and/or System ID will vary between scanners and workstations.

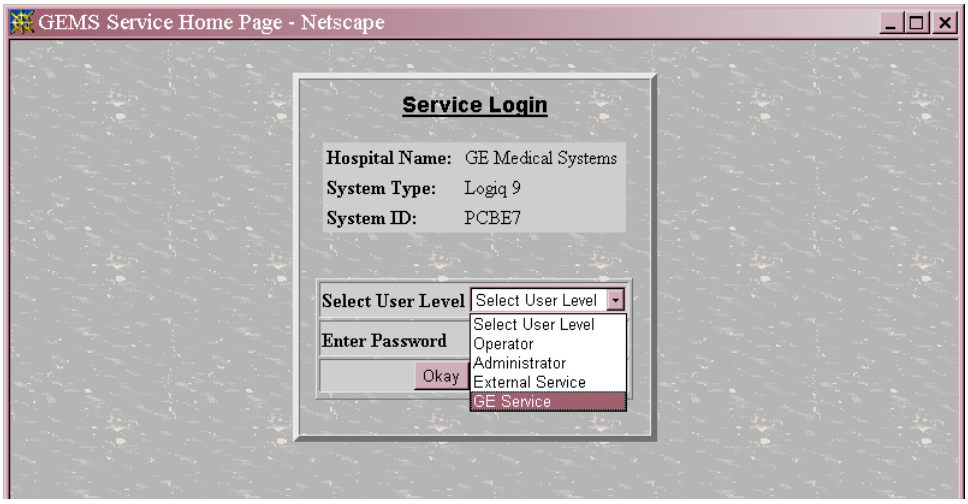


Figure 7-8 Service Login Screen

2.) Select Operator and enter the password ULS, then click on Okay.

3.) Select *Utilities->Scanner Utilities->Disruptive Mode*.

4.) To Enable "Disruptive Mode" select YES.

Once the customer clicks on Yes to enable disruptive mode Figure 7-9 will display on the scanner or workstation.

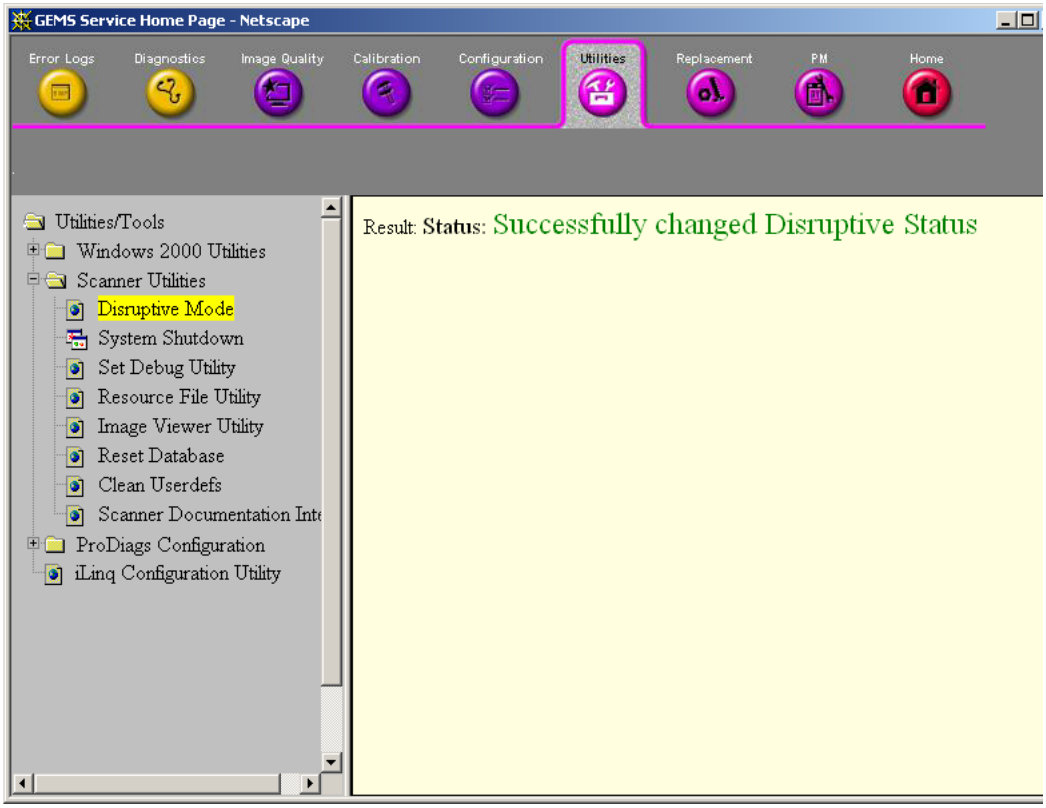


Figure 7-9 Disruptive Mode Enabled

Section 7-5
Diagnostics

As described in **Chapter 5 - Components and Functions (Theory)**, the service platform uses a web-based user interface (UI) to provide access to common service components.

The Diagnostic home page displays a listing of test categories consisting of Acquisition Diagnostics, I/O Devices and Common Diagnostics. Expand the desired main category to select groups or individual tests.

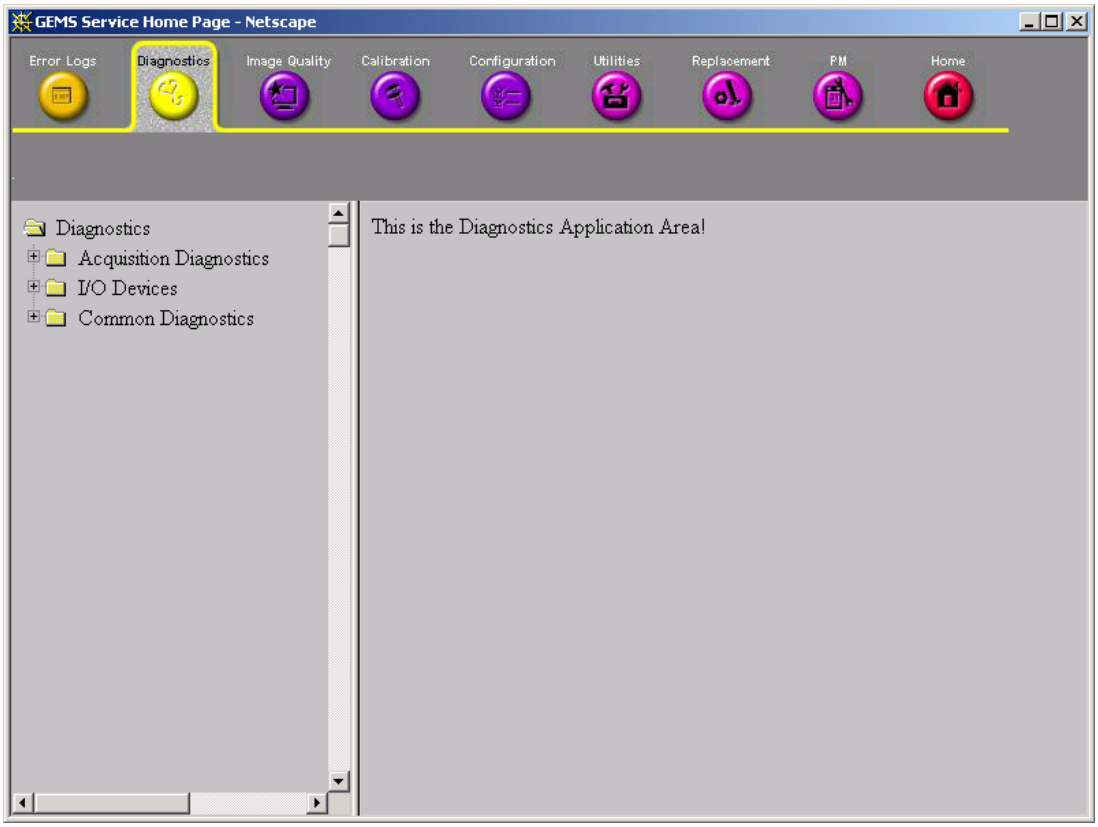


Figure 7-10 Global Service User Interface Diagnostic Screen

Section 7-6
Acquisition Diagnostics

Acquisition Diagnostics is one of three main headings under the GSUI Diagnostics Tab.

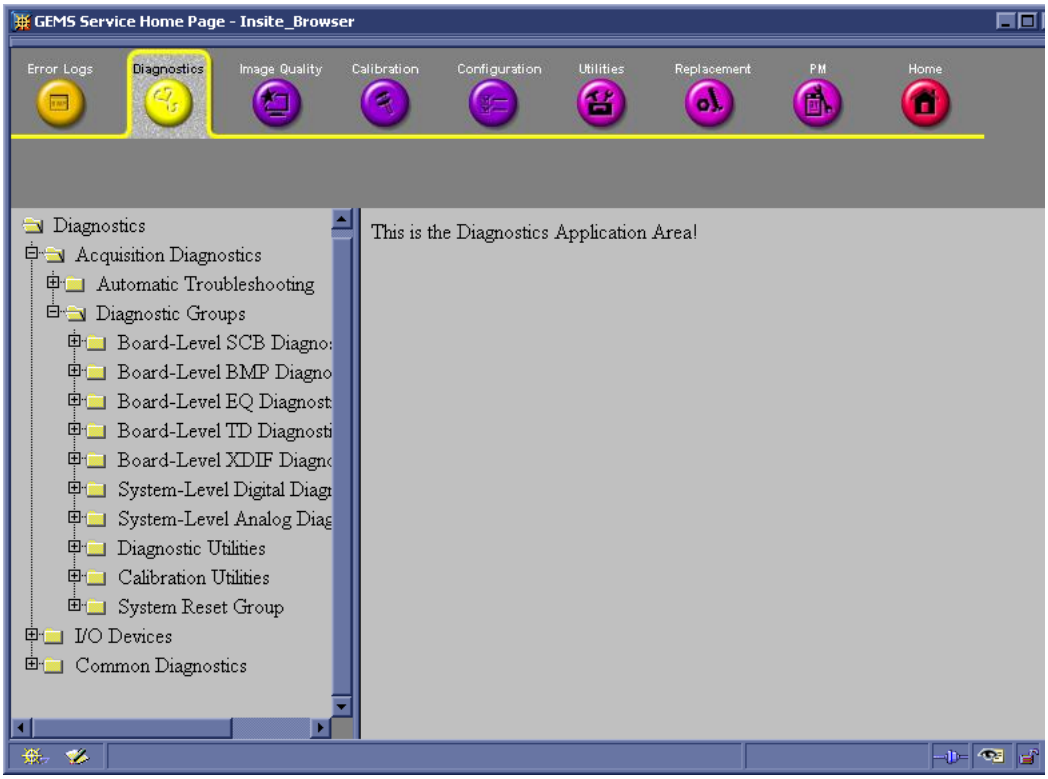


Figure 7-11 Customer Acquisition Diagnostics

Individual selections run diagnostics and return status information identifying any problems.

When you select a test to run, the display changes as shown in Figure 7-12 on page 7-14 .

1.) Instructions Frame
   - Displays either a test-specific text or the default instructions.

2.) Status Frame
   - Initially displays the last known status for a selected diagnostic. Once the diagnostic starts, the frame displays the “current” status of all test results.
   - The Status Frame also contains the user interface elements used for Diagnostic Control and Operator Feedback.

3.) Execute Button
   - This switch has two modes - each with appropriate text:
   - Execute - to start the diagnostic
   - Abort - to stop a diagnostic

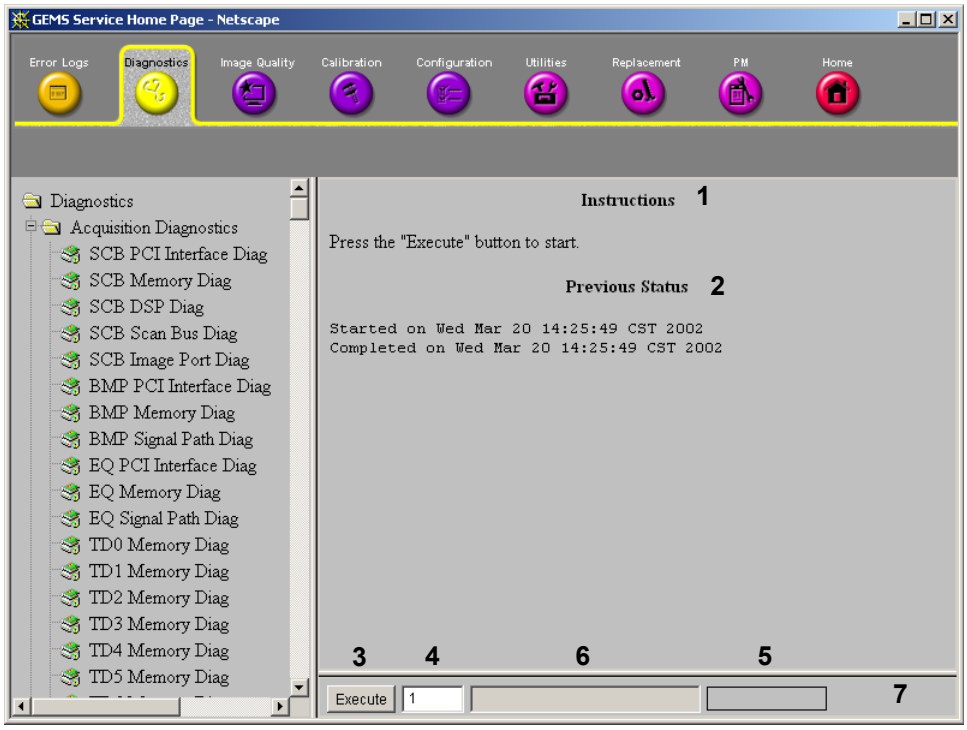


Figure 7-12 Diagnostic Selected

4.) Loop Count

- This is an editable text field that will only accept numeric values of 4 digits or less. When the switch is configured as an “execute” switch and pressed, the loop count field will be queried to determine the number of times to execute the diagnostic.

5.) Progress Indicator

- Displays a graphical progress indicator for the user.

6.) Short Text Message

- Displays brief messages about the test’s progress during execution.

7.) Status Frame Background Color

- Initially gray, the Status Frame background color changes upon completion of a diagnostic to indicate completion status.
- Code Status Fail = Red
- Code Status Pass = Green
- Code Status neither Pass nor Fail (Example: Aborted) = Gray (default color).

7-6-1 Diagnostic Listings

Table 7-2 Acquisition Diagnostics and Utility Listing

Diagnostic/Utility	Function
SCB PCI Interface Diag	Tests the host's ability to communicate with the SCB via the secondary PCI bus
SCB Memory Diag	Tests all of the on-board memory, including registers.
SCB DSP Diag	Tests the Scan Sequencer's DSP and associated components.
SCB Scan Bus Diag	Tests the local Scan Bus and the associated system timing.
SCB Image Port Diag	Tests the Image Port's functionality.
BMP PCI Interface Diag	Tests the host's ability to communicate with the BMP via the PCI bus.
BMP Memory Diag	Tests all of the on-board memory, including registers.
BMP Signal Path Diag	Tests the entire BMP signal path.
EQ PCI Interface Diag	Tests the host's ability to communicate with the registers and memory on the EQ via the PCI bus.
EQ Memory Diag	Tests all of the on-board memory, including registers.
EQ Signal Path Diag	Tests the entire EQ signal path.
TD Memory Diag	Tests all of the on-board memory, for all installed TD boards, including registers.
TD Analog Reference Diag	Tests the AD_REF and VREF voltages on the TD.
Comprehensive Signal Path Diag	Tests the signal path of every channel from the TD Rigel Transmitter Memories to the SCB, via both the EQ and the BMP.
TD Access Diag	Tests all of the Access Modes utilized for Host/TD communication as well as Channel RAM to Rigel transfers.
Analog TGC Diag	Tests the generation of the analog TGC voltage.
XDIF Interface Diag	Tests all of the XDIF functionality that is testable without a probe or probe simulator attached to the system, including the IIC communication.
Power Supply Diag	Tests the system voltages available on the EQ.
Temperature Diag	Tests the temperature of the system, wherever available.
Noise Floor Diag	Measures the noise floor of the system. The noise floor will be calculated form IQ data received without a signal source.
Loopback Diag	Tests the analog front-end of the system.
Acquisition Hardware Information Utility	Writes a file for each Acquisition Hardware FRU containing all Vital Product Data.
Transmit Utility - Start	
Transmit Utility - Change Channel	
Transmit Utility - Stop	
Receive Utility - Single Frame	Receives signal on one channel at a time.
Receive Utility - 8 Frames	
Visual Channel Utility	
High Voltage Reset Utility	Tests whether all TD boards can detect a high voltage fault.
Set VRF Utility	Set the analog VREF to a specified value.
Set TGC Utility	Set the analog TGC to a specified value.
Probe Select Utility	Select a probe connector to be active.
Probe ID Read Utility	Read the Probe ID of all installed probes.

Table 7-2 Acquisition Diagnostics and Utility Listing (Continued)

Diagnostic/Utility	Function
Touchscreen Calibration Utility.	Calibrates the Touch Screen.
Start Touchscreen Verification Utility.	Helps verify the touchscreen calibration.
Front-End Calibration Utility	Measures the Front End DC Offset, Gain, and Phase.
System Restart	Test system restart
System Shutdown.	Tests system shutdown.
OP Panel Interface	Tests the OP Panel interface.
System Power Button Test	Tests the system Power Button.
IIC PCI-DGVIC Diag	Tests the IIC slave devices on the PCI-DGVIC board
IIC IIO Diag	Tests the IIC slave devices on the Internal IO board.
IIC EIO Diag	Tests the IIC slave devices on the External IO lower board.
IIC EIO Upper Diag	Tests the IIC slave devices on the External IO lower board.
PC2IP IIC Troubleshooting Procedure Step1 through 5	Procedure featured with tests that guides and helps you to troubleshoot PC2IP IIC failures.
Footswitch Test Utility	Tests the system Power Button.
PC Diagnostics Interactive tests	Tests standard PC components (CPU, Hard Drive, Memory, CD/DVD drives…) automatically.
PC Diagnostics Non-Interactive tests	Tests standard PC components (keyboard, audio, monitor) non- interactively.

NOTE: In R4.x software: - Front End Calibration Utility has been removed.

7-6-1-1 Calibration Utilities

Touchscreen Calibration: Follow the directions on the Touchscreen. As each of the cross-hairs appear, touch them with your finger or a pencil eraser. You **MUST** hold your finger on the cross-hair until it moves to the next location. If you just tap the calibration cross-hair, there is a better than average chance your calibration will be corrupt.

NOTE: Do NOT use sharp, pointed objects to press on the Touchscreen. You should also be careful if you have long, sharp finger nails. The Touchscreen can be damaged by sharp objects.

After all the cross-hairs are touched the screen is calibrated.

Start/Stop Touchscreen Verification: Select START TOUCHSCREEN VERIFICATION and EXECUTE. The Start Touchscreen Verification brings up a grid. Each time you touch the screen a small red dots appears.

To terminate the verification, select STOP TOUCHSCREEN VERIFICATION and EXECUTE.

Front-End Calibration Utility - DC Offset: All probes must be disconnected. Measures the DC offset of each channel and writes a calibration file for use in zeroing the offset. Application code may then utilize these values to zero each channel's DC offset, by appropriately programming the Rigel beam forming ASIC's on the TD's.

NOTE: In R4.x software: - Front End Calibration Utility has been removed. Do not run this diagnostic test in previous versions of software.

Section 7-7
I/O Devices

7-7-1 OP Panel Utilities - OP Panel Interface

The Operator Panel functionality can be tested using a program (GE Test App) available through the Service Platform.

7-7-2 Launching the Op Panel Test

1.) Log into the Service Platform and click on the Diagnostics tab.

2.) Locate the Op Panel Test under I/O Devices > Op Panel Utilities > Op Panel Interface.

3.) Click Start to launch the GE Test App.

4.) Within the GE Test App, click on Options > CP Type > Musashi. See Figure 7-13.

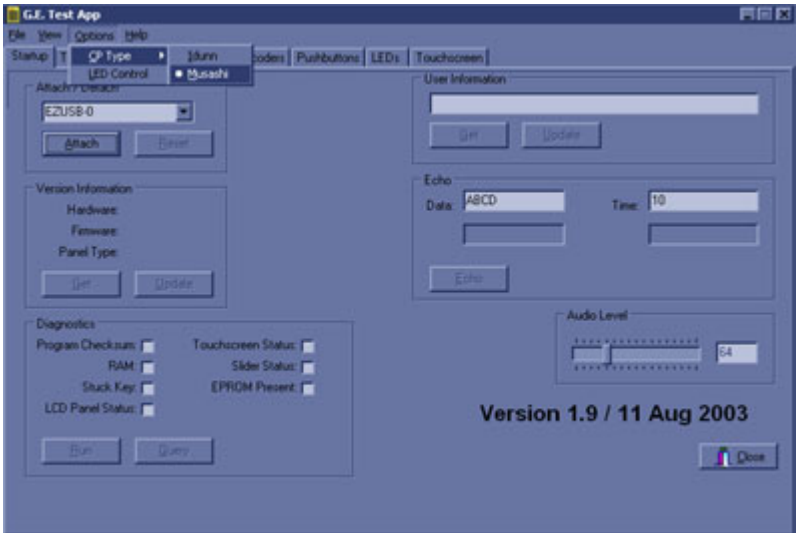
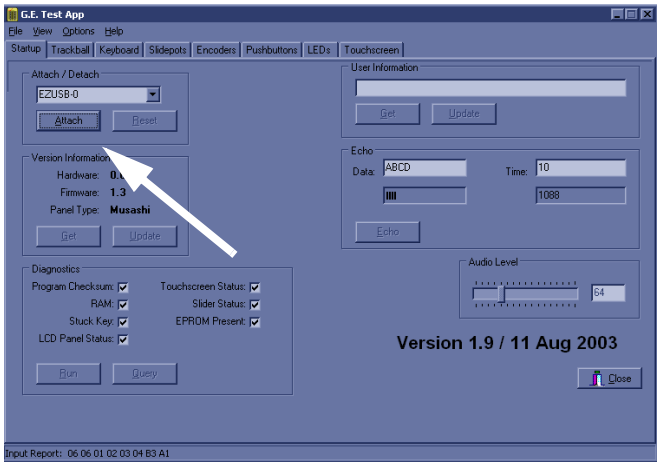
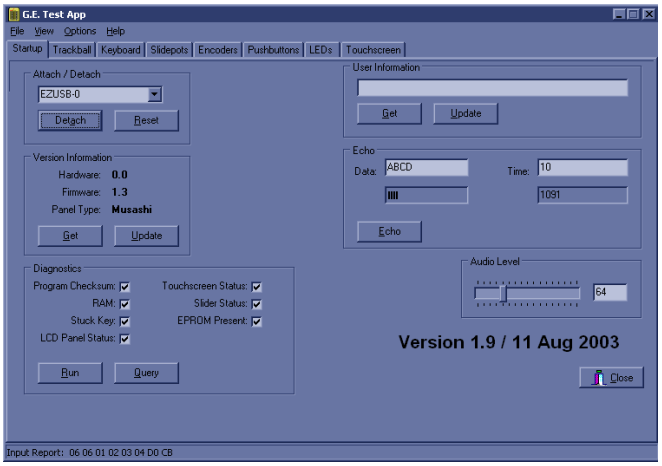


Figure 7-13 Select System Type

5.) On the Startup tab, click on the Attach button to connect the Op Panel to the test interface. The other buttons on the Startup tab will now be active. See Figure 7-14.



Attach Button Active



Detach and Other Buttons Active

Figure 7-14 Attach and GE Test App Startup Tab

6.) Select the tabs to test the various features of the Op Panel.

7-7-3 Trackball Tab

Test the trackball functionality by moving the pointer over the blue box. See Figure 7-15. Verify that the X and Y position are updated as the pointer is moved.

Test the Left and Right select buttons by pressing each button on the op panel. Verify that the corresponding button is highlighted when each button is pressed. See Figure 7-15.

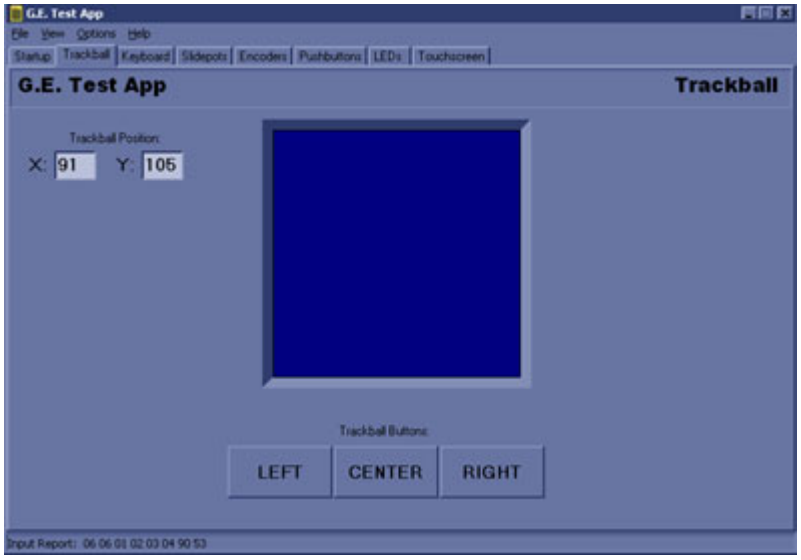


Figure 7-15 Trackball Tab

7-7-4 Keyboard Tab

Test the keyboard functionality by typing on the keyboard. Verify that the corresponding key is highlighted when each key is pressed. See Figure 7-16.

NOTE: The keyboard test does not give an indication when the Print Screen button is pressed.



Figure 7-16 Keyboard Tab

7-7-5 Slidepots Tab

Test the slidepot (TGC) functionality by moving each slidepot through its range. See Figure 7-17. Verify that the visual and numeric position of the slide pot are updated as the slide pot is moved.

Test the LED for each slide pot by clicking on the LED buttons. See Figure 7-17. Visually verify the LED functionality on the upper operator panel.



Figure 7-17 Slidepots Tab

7-7-6 Encoders Tab

Test the encoder functionality by rotating each encoder knob. See Figure 7-18. Verify that the position is updated as the encoder is moved.

Test the encoder button selection function by pressing each knob on the op panel. Verify that the corresponding knob is highlighted when each knob is pressed. See Figure 7-18.



Figure 7-18 Encoders Tab

7-7-7 Pushbuttons Tab

Test the pushbutton functionality by pressing each button on the operator panel. Verify that the corresponding pushbutton is highlighted when each button is pressed. See Figure 7-19.



Figure 7-19 Pushbuttons Tab

7-7-8 LEDs Tab

Test the LED functionality by selecting each button or knob on the GE Test App. See Figure 7-20. Verify that the corresponding LED is illuminated when each button or knob is selected.

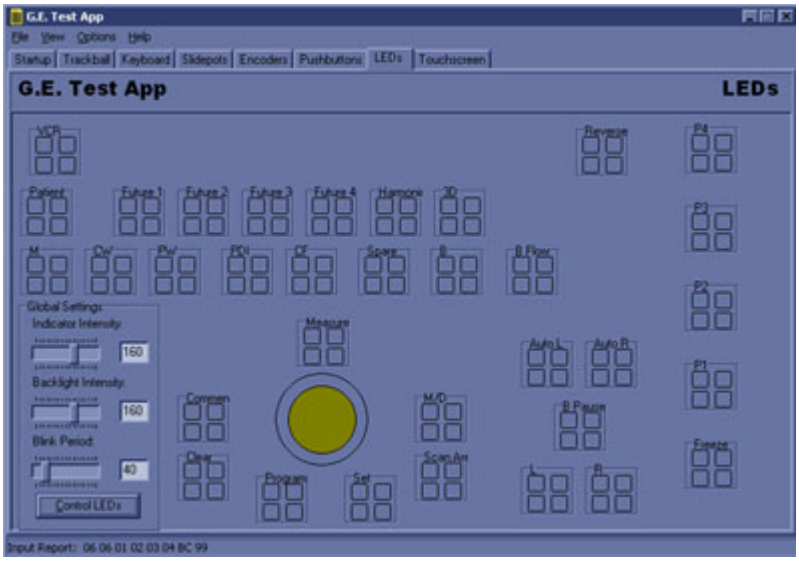


Figure 7-20 LEDs Tab

7-7-9 Touchscreen Tab

Test the touchscreen functionality by pressing on the touch screen of the upper operator panel. Verify that the press is indicated in the black window by a highlighted circle. See Figure 7-21.



Figure 7-21 Touchscreen Tab

7-7-10 Ending the Program

1.) When you have finished testing the Op Panel, close the GE Test App.
2.) In the Service Platform window, click on the Stop button.
3.) Close the Service Platform window.
4.) Shutdown the system and reboot.

Section 7-8
Common Diagnostics

Common Diagnostics is the second main heading under the GSUI heading of Diagnostics.

Figure 7-22 shows the top level menu choices under Common Diagnostics. The subheadings and their respective diagnostic/troubleshooting menu choices are called out and described in the sections below.

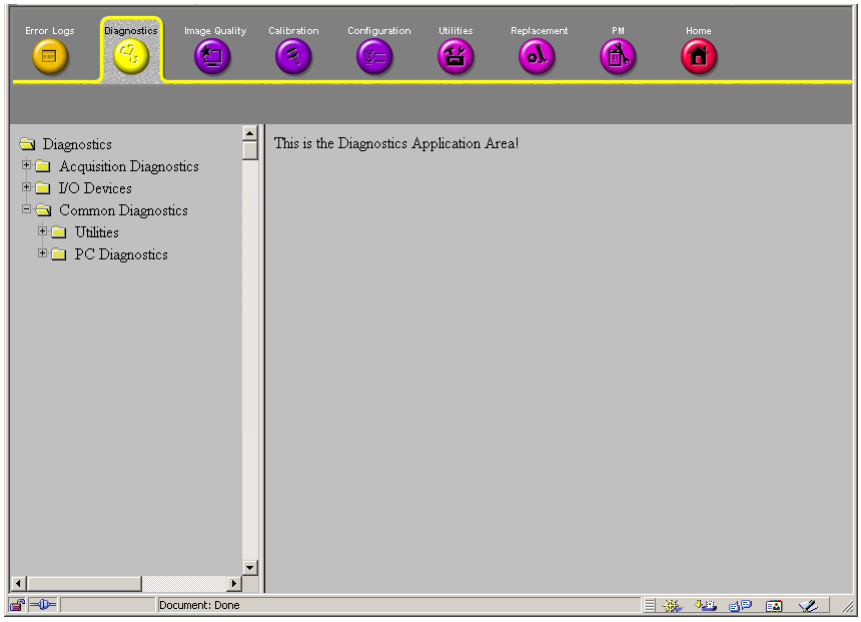


Figure 7-22 Common Diagnostics

7-8-1 Utilities

Provides two selections:

7-8-1-1 Disruptive Mode

Allows you to enable or disable disruptive mode troubleshooting.

7-8-1-2 System Shutdown

Allows for system shutdown from the diagnostic menu. Select to *Restart System* or *Shutdown System.* Also, select to retain Disruptive Mode or Not.

After submitting to restart or shutdown a confirmation screen gives one last chance to confirm or cancel the request.

7-8-2 PC Diagnostics (Non-Interactive Tests)

7-8-2-1 CPU Tests

7-8-2-2 Hard Drive Tests

7-8-2-3 Memory Tests

7-8-2-4 CD/DVD Drive Test

7-8-2-5 Video Test

7-8-2-6 USB Test

7-8-2-7 PCI Board Configuration Test

7-8-2-8 SCSI Device Test

7-8-2-9 AGP Video Card Test

7-8-2-10 Network Test

7-8-3 PC Diagnostics (Interactive Tests)

7-8-3-1 Keyboard Test

7-8-3-2 Audio Test

NOTE: LOGIQ™ 9 does not support MIDI channels. If you try and run the MIDI test, the test may fail.

7-8-3-3 Monitor Test

Section 7-9
Utilities

7-9-1 Dicom Verify Utility

This utility provides an easy way to verify DICOM connectivity between the scanner and DICOM devices on the network. See Figure 7-23.

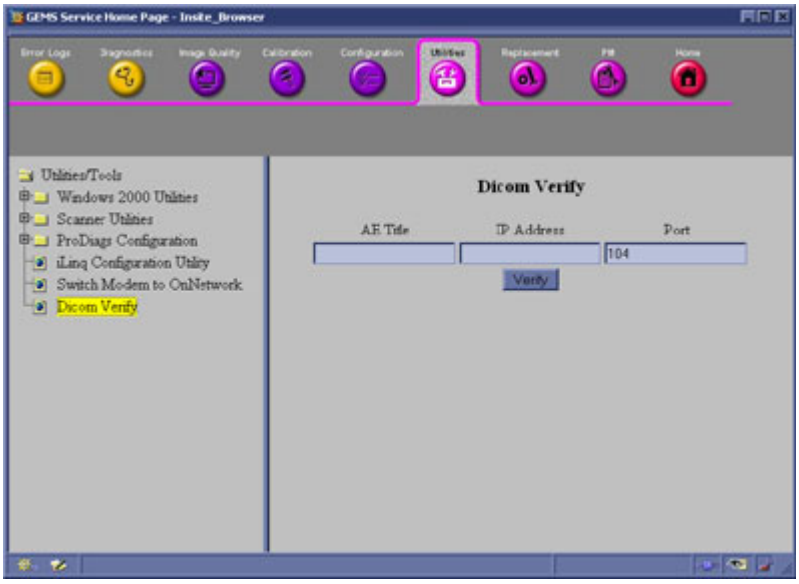


Figure 7-23 Dicom Verify Utility

1.) Enter the AE Title, IP Address, and Port Number for the DICOM device.
2.) Click on the Verify button.
3.) Examine the utility error output. See Figure 7-24 for an example.

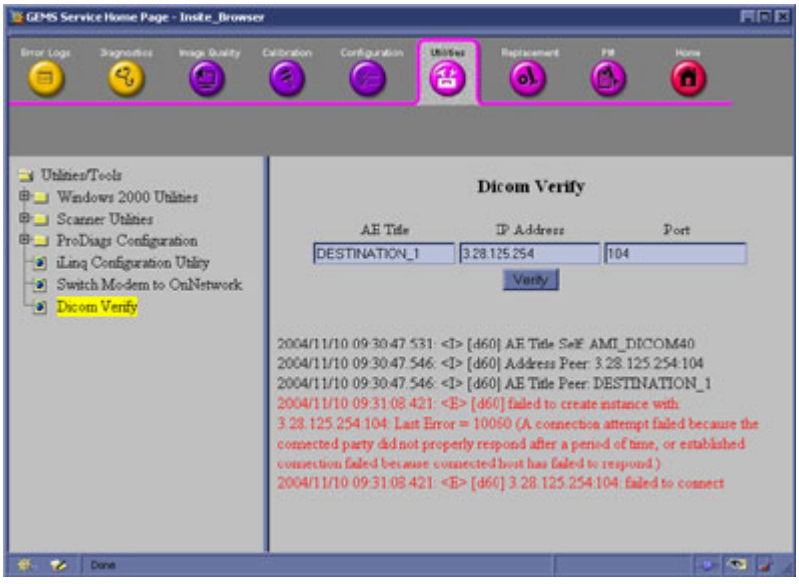

GEMS Service Home Page - Insite_Browser
Utilities/Tools
Windows 2000 Utilities
Scanner Utilities
ProDiags Configuration
iLinq Configuration Utility
Switch Modem to OnNetwork
Dicom Verify
Dicom Verify
AE Title
IP Address
Port
DESTINATION_1
3.28.125.254
104
Verify
2004/11/10 09:30:47.531: <I> [d60] AE Title Self: AMI_DICOM40
2004/11/10 09:30:47.546: <I> [d60] Address Peer: 3.28.125.254:104
2004/11/10 09:30:47.546: <I> [d60] AE Title Peer: DESTINATION_1
2004/11/10 09:31:08.421: <E> [d60] failed to create instance with
3.28.125.254:104: Last Error = 10060 (A connection attempt failed because the
connected party did not properly respond after a period of time, or established
connection failed because connected host has failed to respond.)
2004/11/10 09:31:08.421: <E> [d60] 3.28.125.254:104: failed to connect

Figure 7-24 Example Error Messages

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Chapter 8
Replacement Procedures

Section 8-1
Overview

8-1-1 Purpose of Chapter 8

This chapter contains replacement procedures for different modules and their subsystems. Follow all safety precautions while servicing and repairing this equipment.

Table 8-1 Chapter 8 Contents

Section	Description	Page Number
8-1	Overview	8-1
8-2	Power Supply Battery Pack Replacement Procedure - BEP 1	8-3
8-3	Power Supply Battery Pack Replacement Procedure - BEP 2	8-5
8-4	Power Supply Battery Pack Replacement Procedure - BEP 3	8-7
8-5	Before Starting a Software Upgrade	8-9
8-6	Image Management Guide	8-10
8-7	Loading Base Image Software	8-17
8-8	Loading Application Software	8-24
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8-14	Frog Leg Angle Adjustment	8-51

8-1-2 Definitions of Left, Right, Front and Back



Left **Front** **Rear** **Right**

Figure 8-1 Console Views

8-1-3 Returning/Shipping Probes and Repair Parts

Equipment being returned must be clean and free of blood and other infectious substances.

GEMS policy states that body fluids must be properly removed from any part or equipment prior to shipment. GEMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or an ultrasound probe). The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

NOTE: The US Department of Transportation (DOT) has ruled that "items that were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care" are "regulated medical waste" for transportation purposes and must be transported as a hazardous material.

Section 8-2
Power Supply Battery Pack Replacement Procedure - BEP 1

8-2-1 Manpower

One person, .5 hour + travel

8-2-2 Tools

Phillips screwdriver

8-2-3 Preparations

We anticipate, with the exception of a failure, batteries will only need to be replaced once every three years.

1.) Power Off / Shutdown the system.
2.) Remove the left-side cover.

8-2-4 Power Supply Battery Pack Removal Procedure

1.) Remove the cover of the Back End Processor.
2.) Remove the four screws from the power supply battery pack cover plate.
3.) Disconnect the battery pack connection wire.
4.) Remove the power supply battery pack from the Back End Processor.

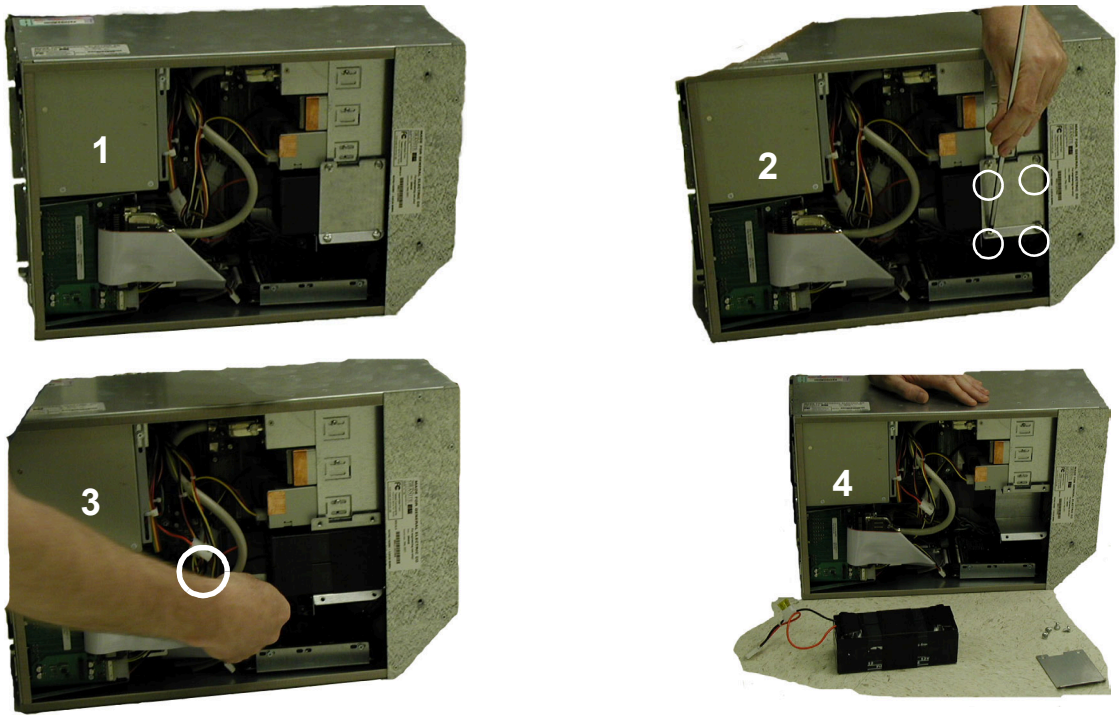


Figure 8-2 Removing / Installing the Power Supply Battery Pack

8-2-5 Power Supply Battery Pack Installation Procedure - BEP 1

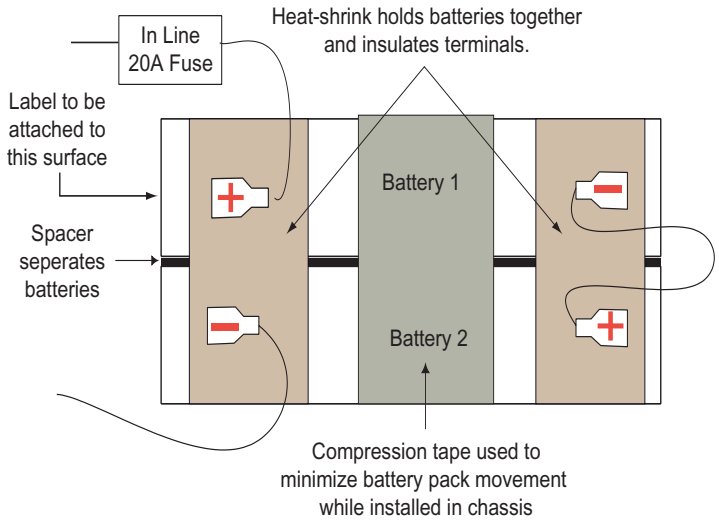


Figure 8-3 Power Supply Battery Pack

1.) Slide the new power supply battery pack into its position in the Back End Processor.
2.) Attach the power supply battery pack cover plate and secure it with the four screws removed .
3.) Apply Power .... turn the system on.
4.) Connect the new battery pack to the power supply connector while power is applied to the Back End Processor. This will avoid a possible spark while connecting the battery.

CAUTION **The battery pack contains a 24V charge that will cause a spark when it is re-connected to the power supply without power applied to the Back End Processor. Be careful that this spark does not damage any equipment or cause any personal injury.**

To avoid the spark, connect the battery with power applied to the BackEnd Processor.

5.) Attach the cover for the Back End Processor removed.

The UPS batteries will drain slightly when the system is in the off condition. The off condition is defined as:

- Circuit Breaker in the OFF position
- System unplugged from the wall outlet

If the system is left in the OFF condition for an extended period of time (3 to 5 days or more), the system may not boot up or may beep when turned ON. Should this occur, the system needs to recharge the UPS batteries. This could take 15 minutes to as long as 24 hours, depending on the battery age, system input voltage and system temperature.

To eliminate draining the UPS batteries, the system should remain plugged into the wall outlet with the circuit breaker in the ON position.

8-2-6 Battery Disposal:

Please make sure replaced batteries are included in the recycling loop.

Section 8-3
Power Supply Battery Pack Replacement Procedure - BEP 2

8-3-1 Manpower

One person, 15 minutes + travel

8-3-2 Tools

Phillips screwdriver

8-3-3 Preparations

1.) Power Off / Shutdown the system.
2.) Remove the left-side covers.

8-3-4 Power Supply Battery Pack Removal Procedure

1.) Remove the cover of the Back End Processor.
2.) Remove the screw from the power supply battery pack cover plate. See Figure 8-4.

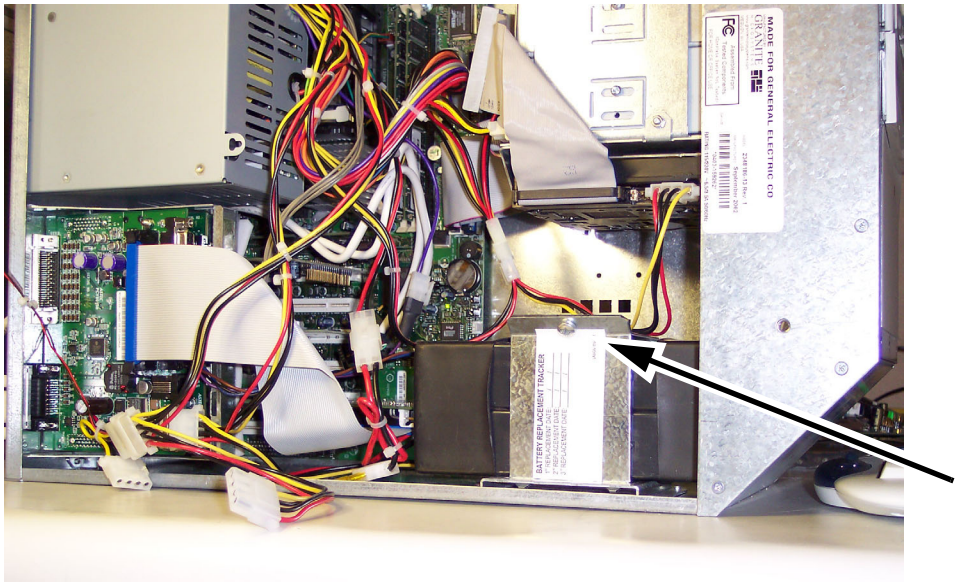


Figure 8-4 BEP 2 Power Supply Battery Pack Cover Plate

3.) Tip the power supply battery pack cover plate forward and lift up to remove, refer to Figure 8-5.

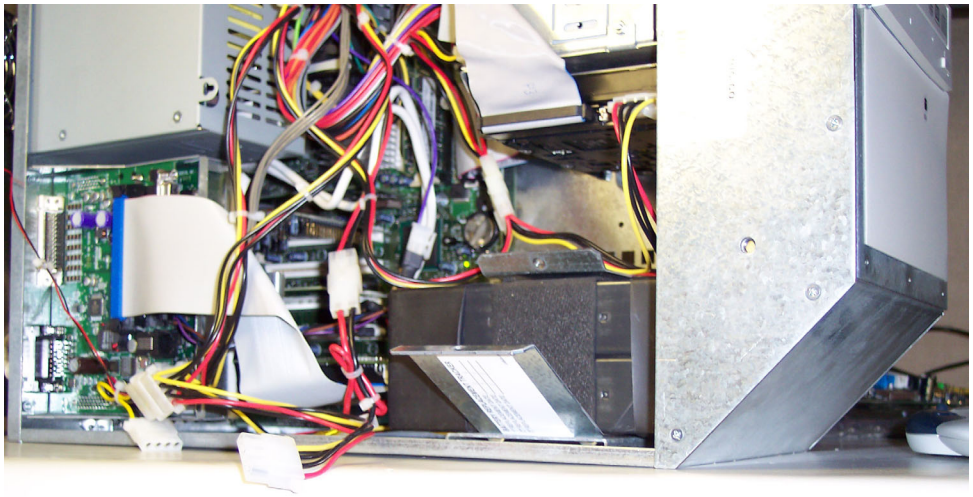


Figure 8-5 BEP 2 Power Supply Battery Pack Cover Plate Tipped Forward

4.) Disconnect the battery pack connection wire.

5.) Remove the power supply battery pack from the Back End Processor.

8-3-5 Power Supply Battery Pack Installation Procedure - BEP 2

1.) Slide the new power supply battery pack into its position in the Back End Processor.

2.) Attach the power supply battery pack cover plate and secure it with the screw removed .

3.) Apply Power .... turn the system on.

4.) Connect the new battery pack to the power supply connector while power is applied to the Back End Processor. This will avoid a possible spark while connecting the battery.

CAUTION **The battery pack contains a 24V charge that will cause a spark when it is re-connected to the power supply without power applied to the Back End Processor. Be careful that this spark does not damage any equipment or cause any personal injury.**

To avoid the spark, connect the battery with power applied to the BackEnd Processor.

5.) Attach the cover for the Back End Processor removed.

8-3-6 Battery Disposal:

Please make sure replaced batteries are included in the recycling loop.

Section 8-4
Power Supply Battery Pack Replacement Procedure - BEP 3

8-4-1 Manpower

One person, 15 minutes + travel

8-4-2 Tools

Phillips screwdriver

8-4-3 Preparations

1.) Power Off / Shutdown the system.
2.) Remove the left-side cover.

8-4-4 Power Supply Battery Pack Removal Procedure

1.) Remove the cover of the Back End Processor.

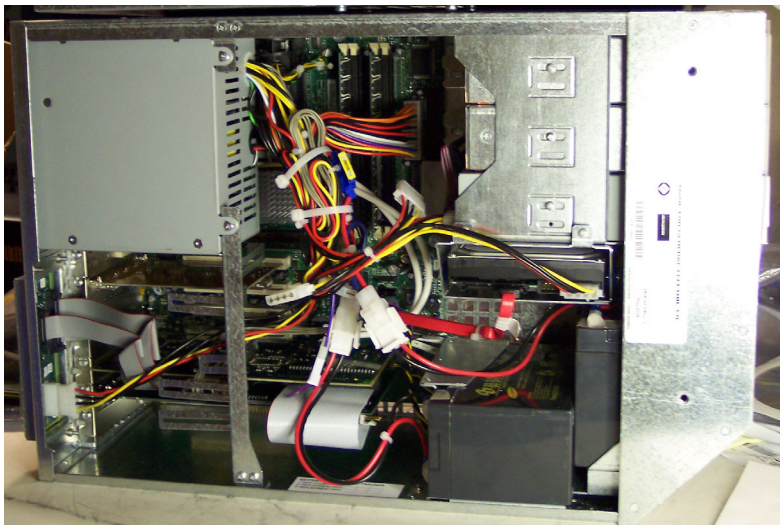


Figure 8-6 BEP 3 with cover removed

2.) Disconnect the battery pack connection wires. See Figure 8-7.

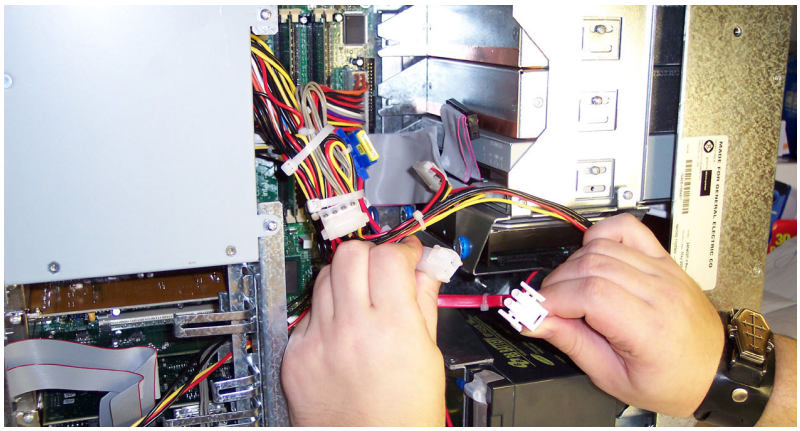


Figure 8-7 Disconnect Battery Pack Connection Wires

3.) Remove the first power supply battery pack from the Back End Processor 3. See Figure 8-8.

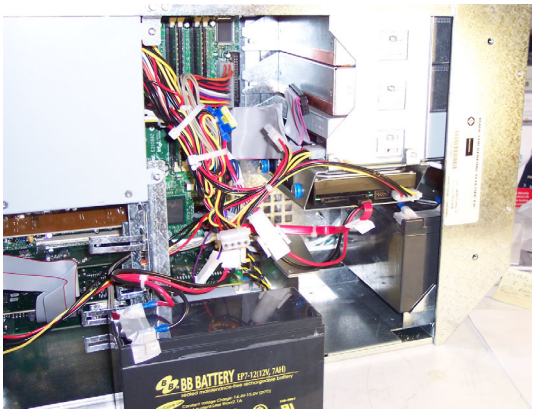


Figure 8-8 BEP 3 One Power Supply Battery Pack Removed

4.) Remove the other power supply battery pack from the Back End Processor 3. See Figure 8-9.

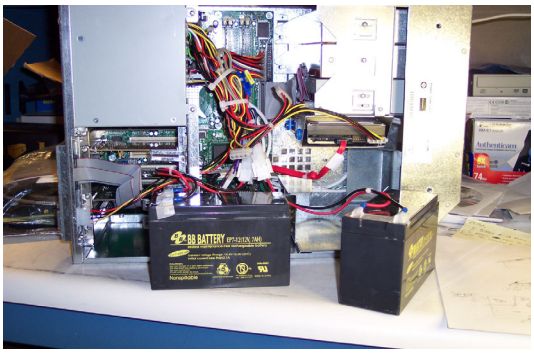


Figure 8-9 BEP 3 Both Power Supply Battery Packs Removed

8-4-5 Power Supply Battery Pack Installation Procedure - BEP 3

1.) Slide the new power supply battery packs into position in the Back End Processor.

2.) Apply Power .... turn the system on.

3.) Connect the new battery pack to the power supply connector while power is applied to the Back End Processor. This will avoid a possible spark while connecting the battery.

CAUTION **The battery pack contains a 24V charge that will cause a spark when it is re-connected to the power supply without power applied to the Back End Processor. Be careful that this spark does not damage any equipment or cause any personal injury.**

To avoid the spark, connect the battery with power applied to the BackEnd Processor.

4.) Attach the cover for the Back End Processor removed.

8-4-6 Battery Disposal:

Please make sure replaced batteries are included in the recycling loop.

Section 8-5
Before Starting a Software Upgrade

8-5-1 Printers

Any customised print settings will be lost when the new base image is loaded. If the customer has any on board, peripheral or network printers, any settings they have made in the device driver, such as Gray Scale Images, will be lost. These printer settings will need to be recorded. You need to go to Utilities>System>Peripherals>Printers in order to record the printer settings.

8-5-2 Save Connectivity Settings

8-5-2-1 DICOM TCPIP Settings

NOTE: ***DICOM TCPIP settings should not be deleted with the Base Image Load due to the use of upgrade scripts. However, It may be helpful to record these settings before proceeding in case an error occurs in the loading of software.***

NOTE: *DICOM Workflows and DICOM Device Configurations are saved when you preform the User-Defined backup procedure in Section* 8-6-3 "User-Defined Backup Protocols" on page 8-14.

If you want to Import exams back on to your system after the software load, you should record any vital DICOM data before proceeding.

1.) Select Utilities>Connectivity>TCPIP tab and record all information on that tab with particular attention to:

- The “Enable DHCP” box should **NOT** be checked
- Computer Name: _____
- IP-Address: _____/_____/_____/_____
- Subnet Mask: _____/_____/_____/_____
- Default Gateway: _____/_____/_____/_____
- Remote Archive IP-Address: _____/_____/_____/_____
- Remote Archive Name: _____

Section 8-6
Image Management Guide

8-6-1 Managing Patient Data and Presets

Save to MOD, CD-R or DVD-R any patient data, images, and system presets that have been stored or configured. Installing the base operating software may delete some patient data, images and system setups saved on the system.

8-6-1-1 Patient Images and Data

EZBackup/Move

Use this to copy both patient data and images for specified patient(s) from LOGIQ™ 9 to DVD-R, CD-R or MOD.

Refer to Section 8-6-2 "EZBackup/Move" on page 8-11.

8-6-1-2 Preset Data

User-Defined Backup Protocols

Use this to copy User-Defined presets before doing a base image software load.

Refer to Section 8-6-3 "User-Defined Backup Protocols" on page 8-14.

8-6-1-3 Backup Media

DVD Media Requirements

Only DVD-R. DO NOT use DVD-RW or DVD+R.

CD-ROM Media Requirements

Only use CD-R CD-ROMs, DO NOT use CD-RW CD-ROMs. Also, the CD-R CD-ROM MUST support 16x writing speed or greater.

CD-ROM Handling Tips

To eject the CD, always press ***F3***. **DO NOT** press the eject button on the CD-ROM/DVD Drive.

Always finalize the CD-ROM. This allows you to read the CD-ROM on any other PC.

DO NOT finalize the CD if you want to add more images to the CD.

8-6-2 EZBackup/Move

EZBackup/Move allows you to manage hard disk space (move images off the hard drive) while maintaining the patient database on the scanner, as well as to back up the patient database and images.

1.) Specify the EZBackup/Move setup on the Utility --> System --> Backup/Restore page.

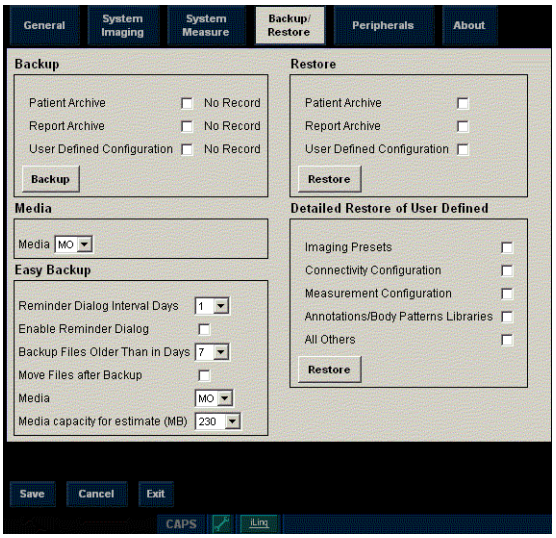


Figure 8-10 Utility > System > Backup/Restore Preset Menu

Table 8-2 EZBackup/Move Preset Parameters

Preset Parameter	Description
Reminder Dialog Interval days	Specify the number of days after the last backup that you want the system to prompt you to perform an EZBackup/Move procedure (only for moving images).
Enable Reminder Dialog	Select to activate the EZBackup/Move reminder pop-up dialog.
Backup files older than in days	The system will backup images older than the number of days specified here. If you enter a zero (0), then all of the images from today on will be backed up.
Move files after backup	Check this box to delete images from the hard drive after the backup.
Media	Select media type.
Media capacity for estimate (MB)	Specify the capacity of the backup media.

2.) To start the EZBackup/Move procedure, go to the Patient menu and select the EZBackup/Move button at the lower right-hand position of the Patient list. The EZBackup/Move Wizard starts.

8-6-2 EZBackup/Move (cont'd)

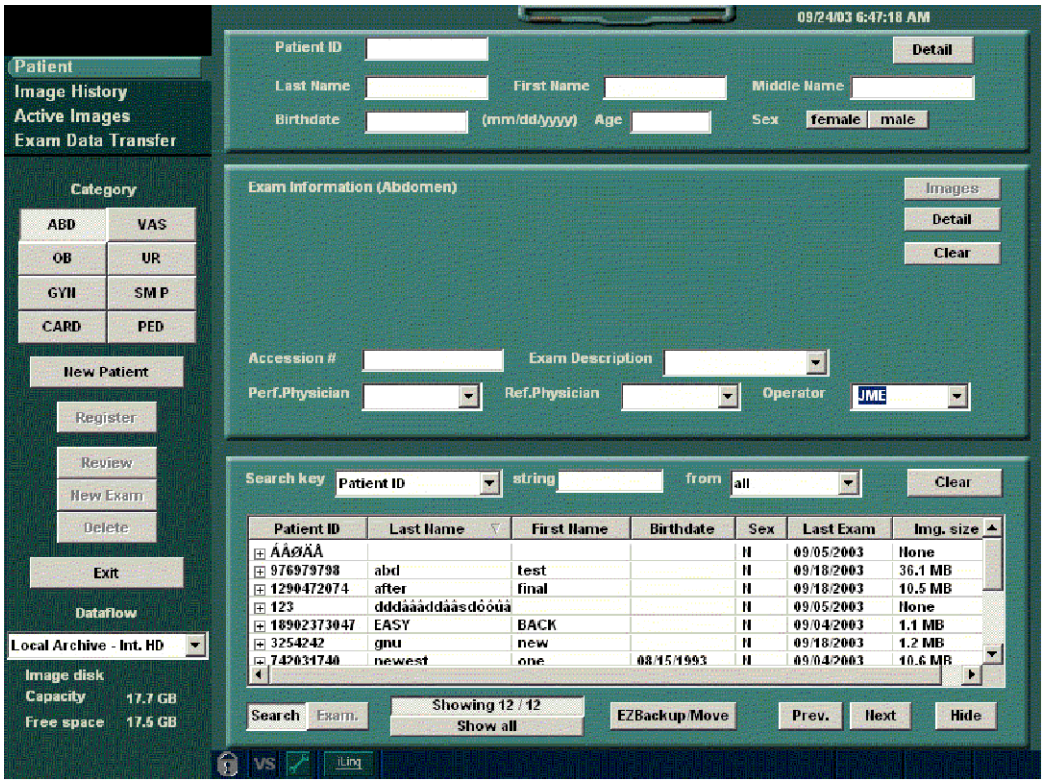


Figure 8-11 New Patient EZBackup/Move Example

NOTE: EZBackup/Move can take up to 20 minutes (or longer, depending on the size of the backup). Make sure to schedule this at the same time daily, when no patients are scheduled.

3.) Verify the information on the first page of the EZBackup/Move Wizard, then press Next.

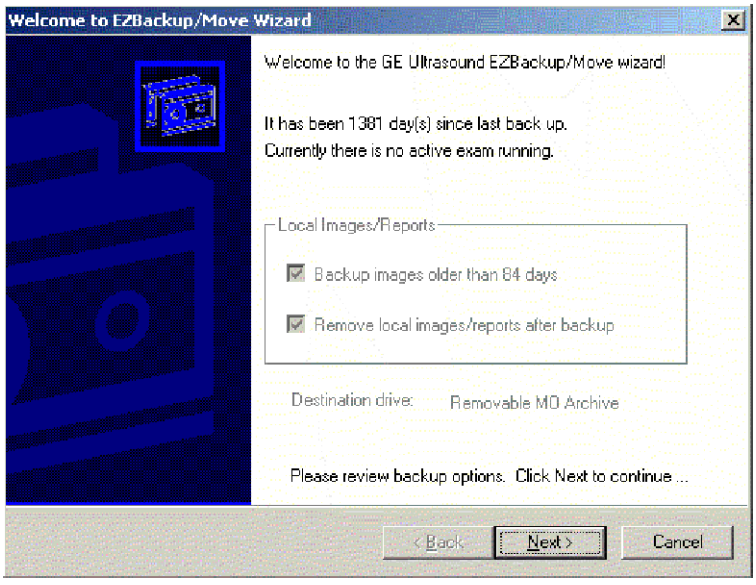

Welcome to EZBackup/Move Wizard
Welcome to the GE Ultrasound EZBackup/Move wizard!
It has been 1381 day(s) since last back up.
Currently there is no active exam running.
Local Images/Reports
Backup images older than 84 days
Remove local images/reports after backup
Destination drive: Removable MO Archive
Please review backup options. Click Next to continue ...
< Back
Next >
Cancel

Figure 8-12 EZBackup/Move Wizard, Page 1

8-6-2 EZBackup/Move (cont'd)

NOTE: You do not need to format the media prior to performing an EZBackup/Move.

NOTE: EZBackup/Move cannot span a single image across two (2) or more media. Therefore, if EZBackup/Move encounters an image that is greater than the capacity of the media, it skips the oversized image.

NOTE: EZBackup/Move does not store images to media in sequential order. Instead it maximizes the most amount of images per media.

4.) Verify the information on the EZBackup/Move Wizard, Page 2. The backup may span multiple media. This page tells you how many media you need to do this backup. After you have gathered the media (allow for one extra media, just in case), you are ready to begin the backup. Press Next.

5.) A pop-up message appears that provides you with the media label. Label the media, then insert the media. Press OK.

6.) The status menu appears. When the backup/move has been completed, press Next.

NOTE: When/if you need to insert the next media, a message appears providing you with the media label. Label the media, then insert the next media and press OK.

7.) When the backup is complete, the Backup completed page appears.

8-6-3 User-Defined Backup Protocols

1.) Insert the backup media. Format the CD-R or MOD. (DVD-R do not need to be formated.) Select the Utility tab on the Measurement Selection Menu. Select Connectivity, then Tools. Label the media.

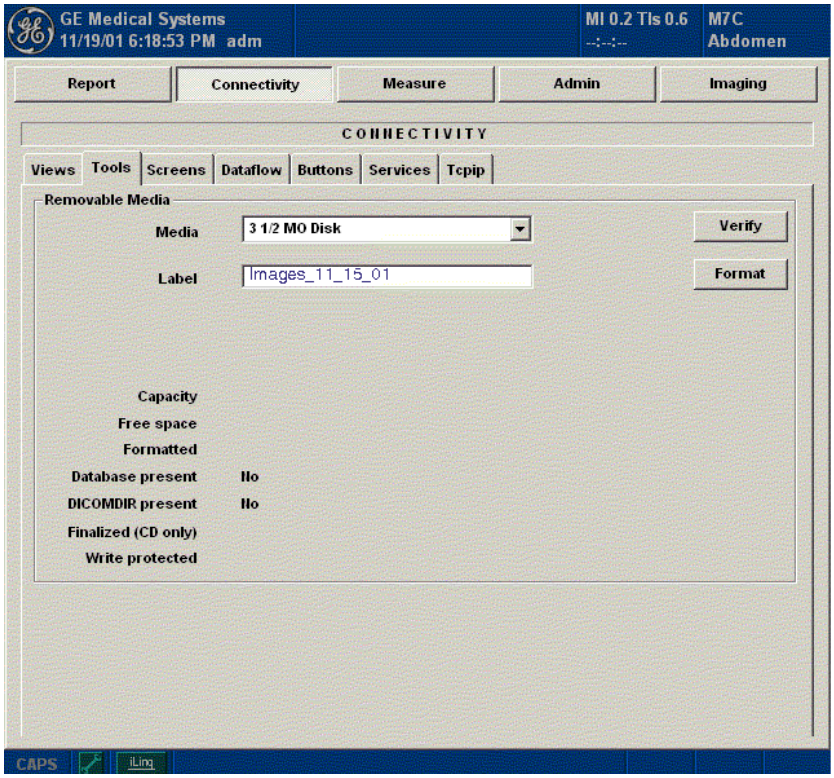


Figure 8-13 Format MOD/CD-ROM Screen

2.) The Ultrasound system displays a pop-up menu when the formatting has been completed. Press Ok to continue.Verify that the format was successful.

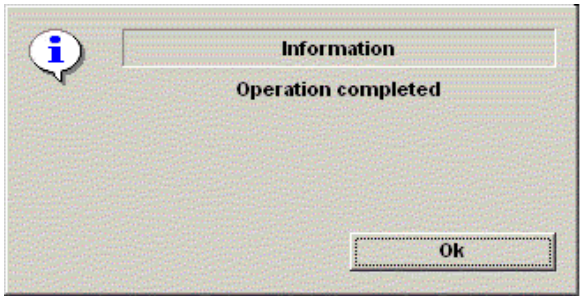


Figure 8-14 Format Successful Pop-up Menu

3.) On the Touch Panel, press Utility.

4.) On the Utility Touch Panel, press System.

5.) On the monitor display, select Backup/Restore. The Backup/Restore screen is displayed.

NOTE: If you are not logged in with administrator privileges, the Operator Login window is displayed. Log on with administrator privileges.

8-6-3 User-Defined Backup Protocols (cont'd)

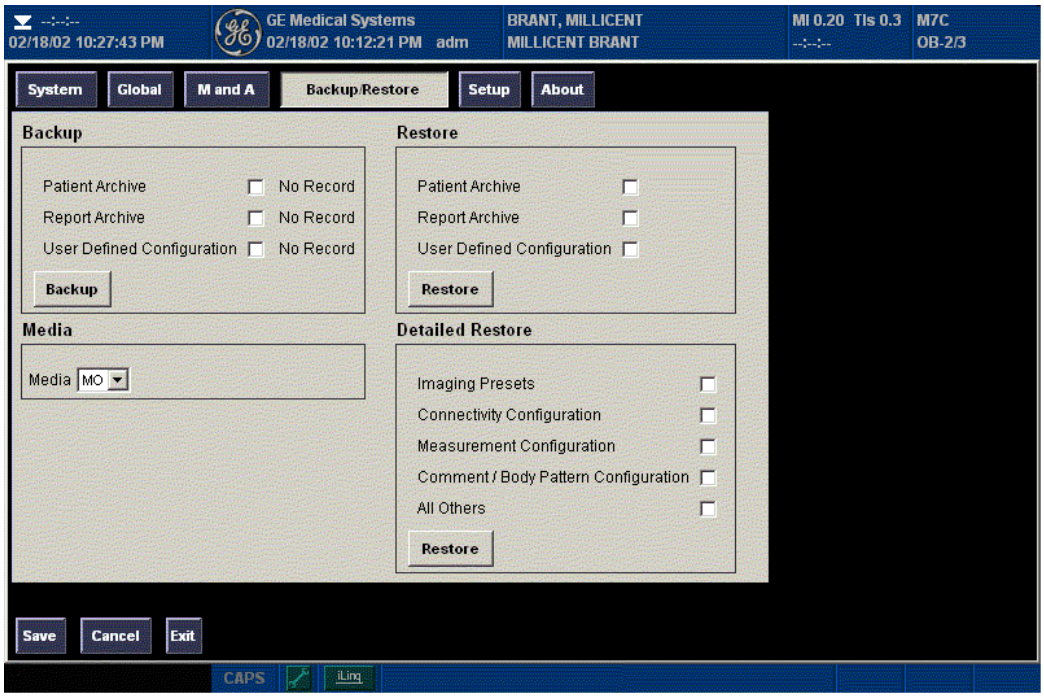


Figure 8-15 Backup Menu- Prior to R4.X.X

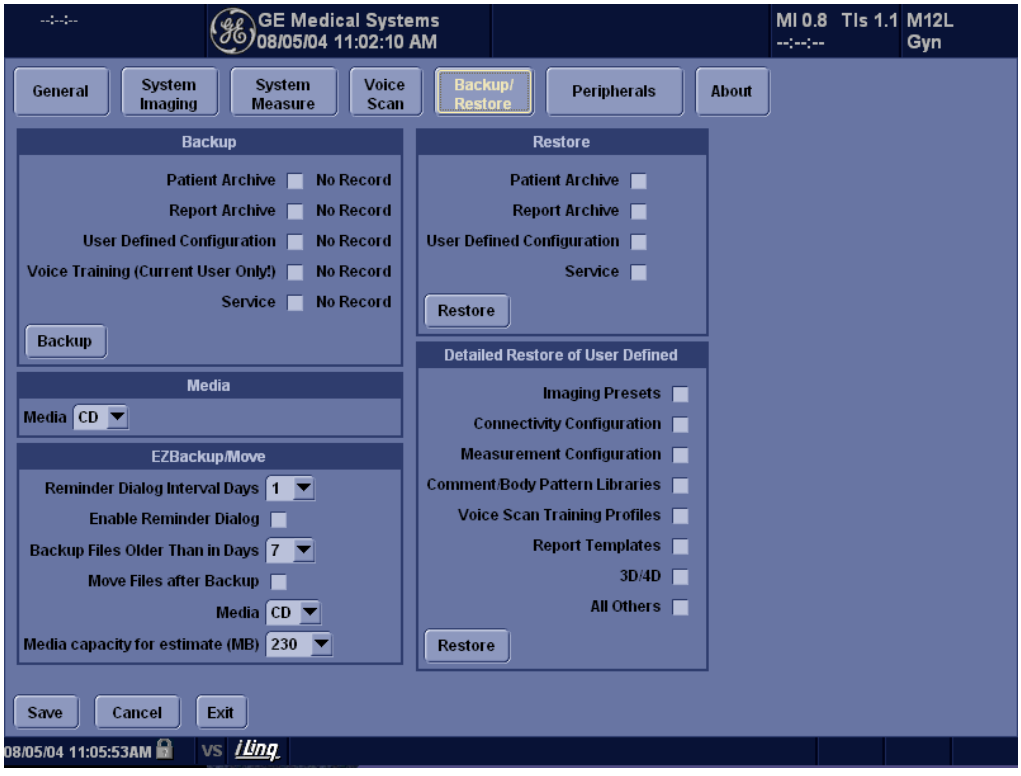


Figure 8-16 Backup / Restore Screen - R4.X. X and later

NOTE: The detailed section of this menu decouples the user defined configuration above. This allows you to selectively restore what you want to restore across multiple machines. Refer to Chapter 16 "Customizing Your System" in the Basic User Manual for more information.

6.) In the Backup list, select the items you wish to backup.

7.) In the Media field, select MOD, CD or DVD.

8.) Select Backup.

9.) Answer 'Ok' to the following pop-up message as many times as the number of items you are backing up.

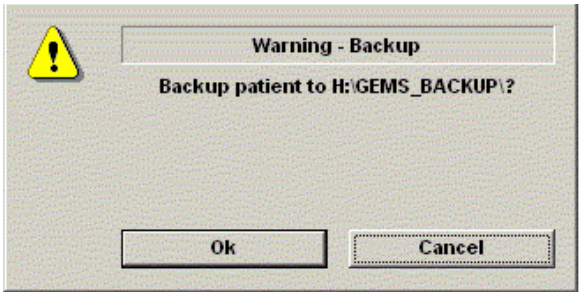


Figure 8-17 Back-up Confirmation Message

The system performs the backup. As it proceeds, status information is displayed on the Backup/Restore screen.

10.) After the backup is complete, press F3 to eject the media.

Section 8-7
Loading Base Image Software

8-7-1 Preparations

Save Connectivity Settings as described in 8-5-2 on page 8-9.

NOTE: While it is believed to be unnecessary, It would not hurt to disconnect the system from the network and remove all transducers.

NOTE: Be sure all printers are connected and turned on. If a printer is plugged in at this time it will automatically install and you won't have to go back to Windows to install it.

NOTE: If the system has any digital peripherals, be sure that they are turned on.

If the system you are loading software on has a BEP 2, please complete steps 1 - step 5 below. If the system you are loading software on has a BEP1 or BEP3 proceed to step 2of 8-7-2 "Base Image Load Procedure" on page 8-19.

NOTE: How to differentiate BEPs easily

- If the MOD is 640M it should be BEP1.
- If the MOD is 1.3G it should be BEP2.X.
- There is no MOD on BEP3 and it has two USB ports.

1.) Power Off / Shutdown the system..

NOTICE Energy Control and Power Lockout

When servicing parts of the system where there is exposure to voltage greater than 30 Volts:
Unplug the system
Maintain control of the system power plug
There are no test points to verify isolation, you must wait for at least 20 seconds for capacitors to discharge



Beware that the AC Control Box, Front End Processor and Back End Processor may be energized even if the power is turned off when the cord is still plugged into the AC Outlet.

WARNING ***Risk of electrical shock, system must be turned off and disconnected from power source. Cord must be controlled at all times. Wait at least 20 seconds for the charge on the FEPS capacitors to bleed off before handling the power supply board.***

2.) Remove the left side cover.

3.) Unplug the microphone input (C11) from the BEP, see Figure 8-18 on page 8-18 .

4.) Wrap the cable end of the plug using electrical tape to isolate it from the BEP. By disconnecting the microphone input, you will be eliminating feedback during the software load. This input may have been unplugged previously, if so, be sure it is wrapped and leave it disconnected.

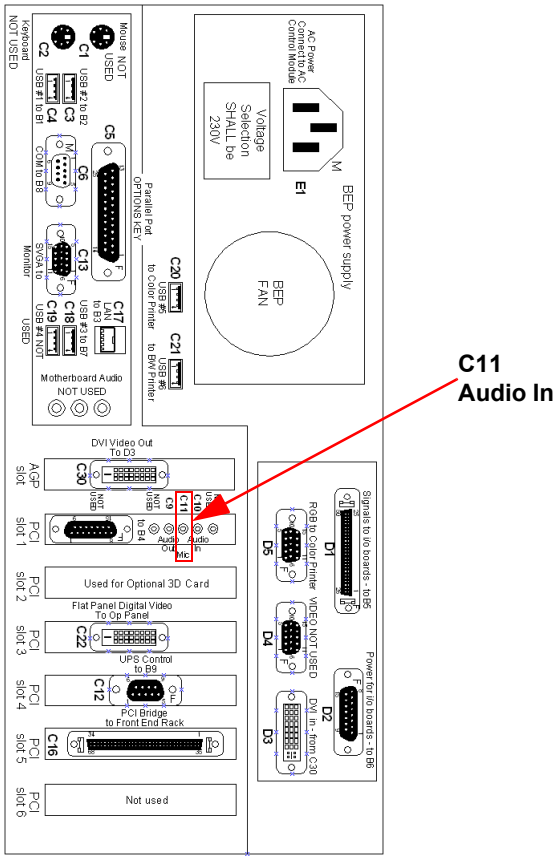


Figure 8-18 BEP2 Cable Identification

5.) Replace the left side cover.

8-7-2 Base Image Load Procedure

WARNING ***The next steps will destroy ALL data on the Scanner***

1.) Turn on the scanner.

2.) Insert the disk labeled “Base System Software Load Image, Disk 1 of 2” into the CD-ROM/DVD drive.

NOTE: There is only one disk for the BEP 1 Base Image.

NOTE: Use the CDs labeled 2404024-3 for BEP 2.x or use the CDs labeled 2404024-4 for BEP3.

3.) Properly turn off the scanner by momentarily pressing the On / Off switch. Select Shutdown from the System Exit menu. Wait for the On / Off switch to turn amber.

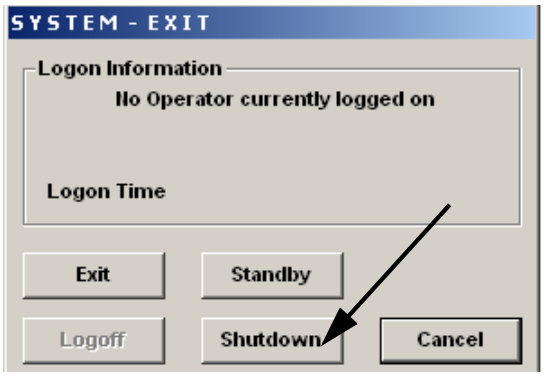


Figure 8-19 Shutdown Dialog Box

NOTE: If the system exit menu does not appear, press Alt F10.

4.) If the system will not shutdown normally, hold down the Standby Switch until the light turns from green to amber.

8-7-2 Base Image Load Procedure (cont'd)

5.) Turn on the scanner. You will see a message displayed on the Touch Panel screen as shown in Figure 8-20 on page 8-20 .

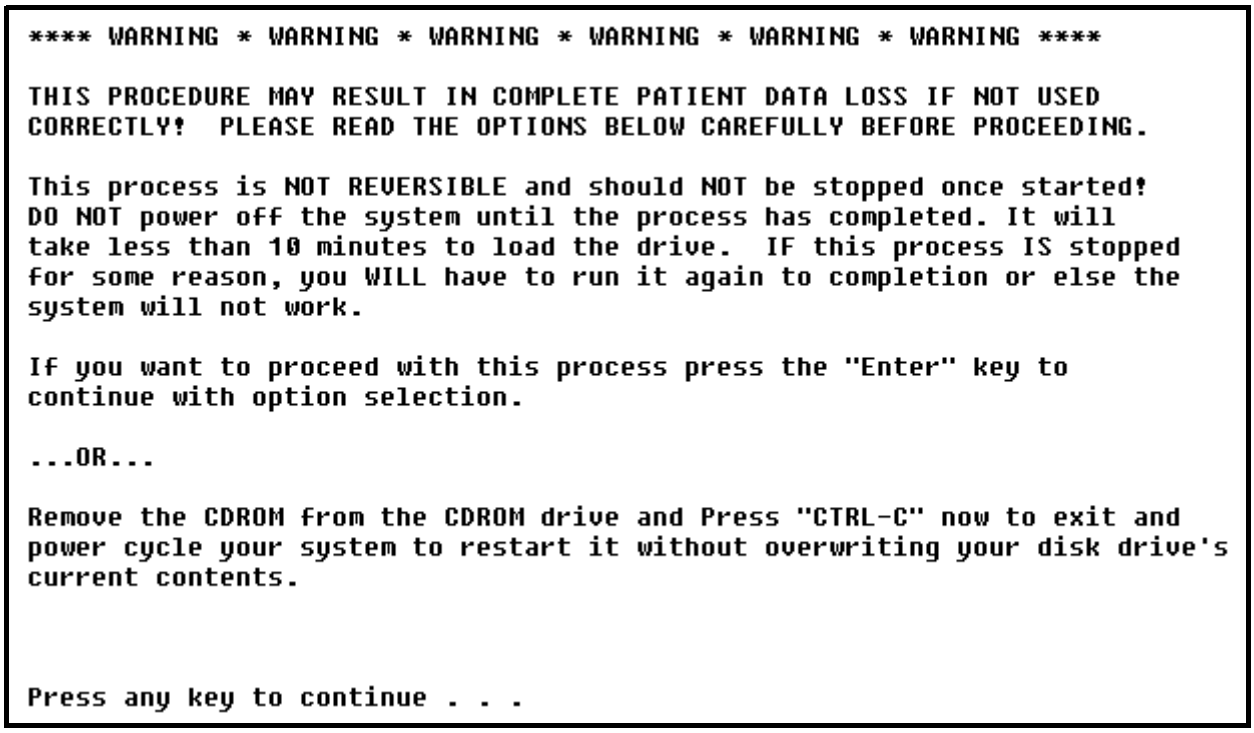

**** WARNING * WARNING * WARNING * WARNING * WARNING * WARNING ****
THIS PROCEDURE MAY RESULT IN COMPLETE PATIENT DATA LOSS IF NOT USED CORRECTLY! PLEASE READ THE OPTIONS BELOW CAREFULLY BEFORE PROCEEDING.
This process is NOT REVERSIBLE and should NOT be stopped once started! DO NOT power off the system until the process has completed. It will take less than 10 minutes to load the drive. IF this process IS stopped for some reason, you WILL have to run it again to completion or else the system will not work.
If you want to proceed with this process press the "Enter" key to continue with option selection.
...OR...
Remove the CDROM from the CDROM drive and Press "CTRL-C" now to exit and power cycle your system to restart it without overwriting your disk drive's current contents.
Press any key to continue . . .

Figure 8-20 Base Load Warning Message

Now is your chance to abort the Base Image load or continue.

6.) Press any key to continue. To abort, remove the CD-ROM from the drive and press **CTRL-C**.

8-7-2 Base Image Load Procedure (cont'd)

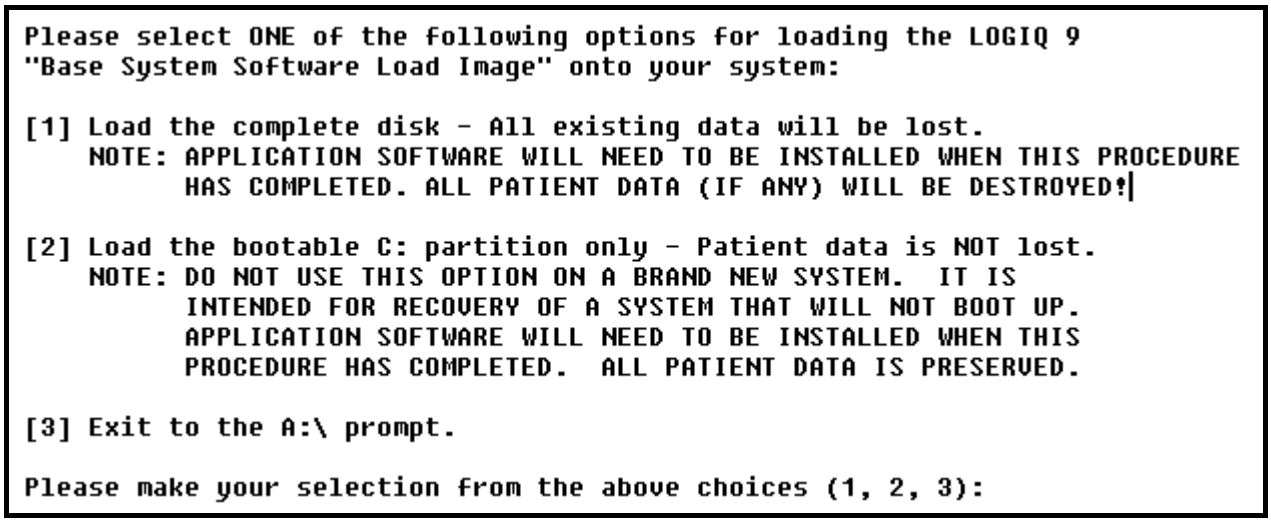

Please select ONE of the following options for loading the LOGIQ 9
"Base System Software Load Image" onto your system:
[1] Load the complete disk - All existing data will be lost.
NOTE: APPLICATION SOFTWARE WILL NEED TO BE INSTALLED WHEN THIS PROCEDURE
HAS COMPLETED. ALL PATIENT DATA (IF ANY) WILL BE DESTROYED!
[2] Load the bootable C: partition only - Patient data is NOT lost.
NOTE: DO NOT USE THIS OPTION ON A BRAND NEW SYSTEM. IT IS
INTENDED FOR RECOVERY OF A SYSTEM THAT WILL NOT BOOT UP.
APPLICATION SOFTWARE WILL NEED TO BE INSTALLED WHEN THIS
PROCEDURE HAS COMPLETED. ALL PATIENT DATA IS PRESERVED.
[3] Exit to the A:\ prompt.
Please make your selection from the above choices (1, 2, 3):

Figure 8-21 Base Load Option Screen

The first choice is to load the complete hard drive.

[1] Load the complete disk - All existing data will be lost.

NOTE: APPLICATION SOFTWARE WILL NEED TO BE INSTALLED WHEN THIS PROCEDURE HAS COMPLETED. ALL PATIENT DATA (IF ANY) WILL BE DESTROYED!

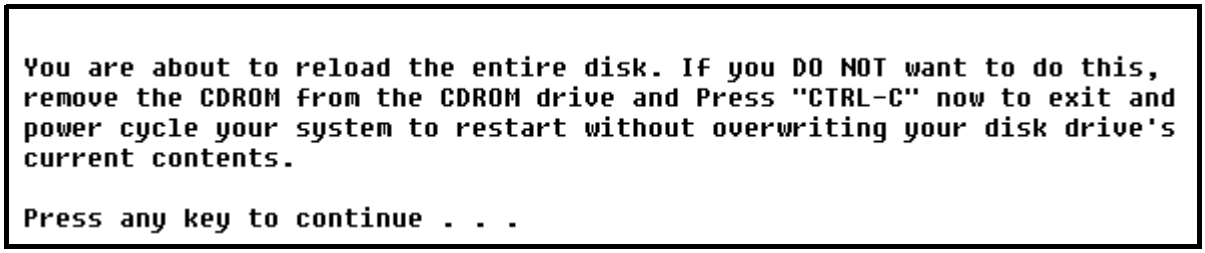

You are about to reload the entire disk. If you DO NOT want to do this,
remove the CDROM from the CDROM drive and Press "CTRL-C" now to exit and
power cycle your system to restart without overwriting your disk drive's
current contents.
Press any key to continue . . .

Figure 8-22 Base Load Option 1 Message

Figure 8-22 is the last warning message before the complete base load process begins. Press any key to continue or abort by pressing **CTRL-C**.

8-7-2 Base Image Load Procedure (cont'd)

The second choice is to load only the bootable portion of the hard drive partition, the "C" partition. This is not an option for a new hard drive that has not been previously partitioned for proper LOGIQ™ 9 operation.

[2] Load the bootable C: partition only - Patient data is NOT lost.

NOTE: DO NOT USE THIS OPTION ON A BRAND NEW SYSTEM. IT IS INTENDED FOR RECOVERY OF A SYSTEM THAT WILL NOT BOOT UP. APPLICATION SOFTWARE WILL NEED TO BE INSTALLED WHEN THIS PROCEDURE HAS COMPLETED. ALL PATIENT DATA IS PRESERVED.

This selection will leave the remaining drive partitions intact.

Table 8-3 LOGIQ™ 9 Drive Partition and Usage

Drive Partition	Usage
C	System Files and Applications
D	User Define and Presets
E	Patient Archive Data
F	File Swap Area

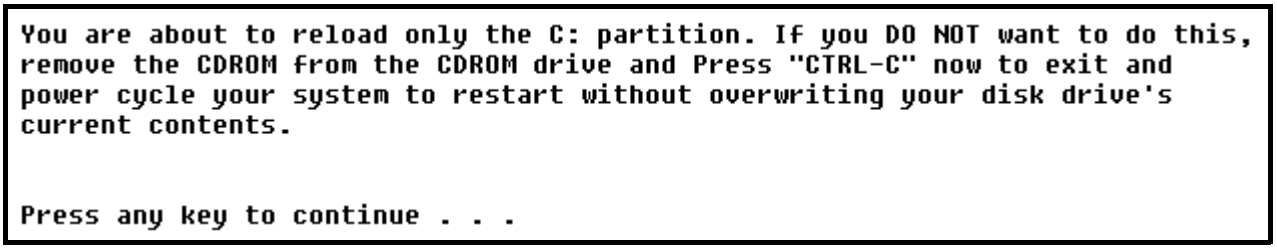

You are about to reload only the C: partition. If you DO NOT want to do this,
remove the CDROM from the CDROM drive and Press "CTRL-C" now to exit and
power cycle your system to restart without overwriting your disk drive's
current contents.
Press any key to continue . . .

Figure 8-23 Base Load Option 2 Message

Figure 8-23 is the last warning message before the base load process begins. Press any key to continue or abort by pressing **CTRL-C**.

The third choice,

[3] Exit to the A:\ prompt. Is intended for manufacturing use only.

This is **NOT** an option as it is intended for manufacturing use only.

If you select Option 3 by mistake, power cycle the system. Hold down the On / Off switch until the light turns amber then turn the system back on.

8-7-2 Base Image Load Procedure (cont'd)

Once you have chosen to continue with Option 1 or Option 2, you will see a screen showing Norton Ghost. This automatically loads a base set of software onto the hard disk. Let it run to completion (Approximately 8-10 mins).

7.) When prompted, remove Disk 1 from the CDROM/DVD drive. Insert Disk 2 and press Enter to continue.

NOTE: There is only one disk for the BEP 1 Base Image.

A message, as shown in Figure 8-24, will be displayed when the process is complete.


The "Base System Software Load Image" process has successfully completed.
You will now need to load the "Application Software" onto your system.
Please remove the CDROM from the drive, power cycle the system and then
continue with the "Application Software" load procedure.

Figure 8-24 Base Load Complete

8.) Remove the disk from the CD-ROM/DVD drive.

NOTE: Remove the CD-ROM from the drive; otherwise you will be repeating the Base System Software Load process when the system boots up.

9.) After removing the CDROM from the drive, press Ctrl+Alt+Delete to reboot the system.

10.) When the system reboots it will automatically log on to start checking hardware. This is a normal process and should be allowed to run to completion.

NOTE: While the script is running, several windows or dialog boxes will appear on the screen. At times it may look like the system is unresponsive. Wait for the "System Settings Change" dialog box "Do You Want to Restart computer now" to appear, approximately 3-4 minutes after the desktop is displayed.

NOTE: Prior to the System Settings Change dialog box, Do NOT touch the system during this process. Activating the keyboard, mouse or front panel could corrupt the installation.

11.) When you get a message to restart Windows, select YES.

The system will come up and map the drives, then the system will reboot again automatically. After the second reboot, the system will come up into the Windows mode.

12.) If the customer has a **USB (Digital Printer)** to be install, plug it in now. The system is still in Windows mode and should recognize the printer and install the necessary driver.

NOTE: If the printer is installed while in application mode, excessive CPU time will be consumed and the system will become very slow to unusable. Shutting down and rebooting will clear the condition. The printer will function correctly.

Section 8-8
Loading Application Software

8-8-1 Loading Applications Software

NOTE: If you have not done so previously, double-click on the My Computer icon. Check for the drive letters assignments of the Removable Drive (MOD) and the CD-ROM/DVD Drive. If the CD-ROM/DVD Drive is not drive "g" and the MOD drive "h" , manually remap the drives.

*NOTE: When installing R2.1.1 software you may see error messages about not being able to replace the following *.dll files: **ginastub.dll** and **msvcr70.dll**. These are known, non-critical issues that are being tracked and will be fixed in the next revision of software.*

NOTE: Starting with the Application S/W R3.0.0C and above, you may get a notification that the service platform is out of date. One of the last steps in the software load is to check the service platform version. If the version is not correct, the screen will turn yellow and you will get a pop-up notifying you that you must reghost the C drive and reinstall software to get the latest service software. If you do not do this service may not work.

1.) Place the "Application Software" CD into the CD-ROM/DVD drive.
2.) Wait about 15 seconds. A window will pop-up showing you the contents of the drive. Double click on LoadSoftware.bat to load the software.

NOTE: If this pop-up window does not open in a minute then perform steps A and B below.

A.) Select the START button on the tool bar at the bottom of the LCD screen and select "**Run...**".
B.) Enter "**g:\LoadSoftware**" into the dialog box as shown in Figure 8-25.

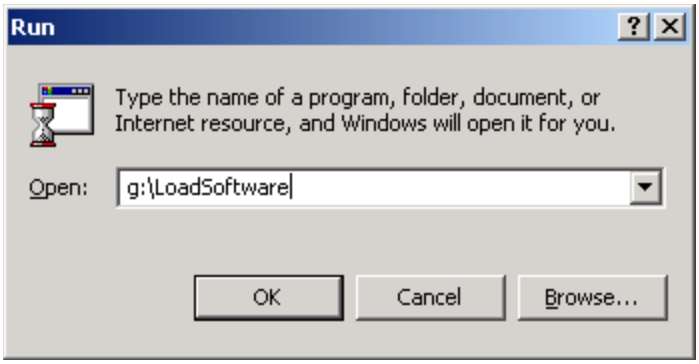


Figure 8-25 Run Load Software

3.) You will see a screen that warns you that you are about to load software, press the Enter key or select OK to start the process.
4.) You will see a Command (CMD) window open similar to the one shown in Figure 8-26.

8-8-1 Loading Applications Software (cont'd)

```
**************************************************************************
* WARNING: This batch file installs the LOGIQ 9 application software    *
*          onto your system. First it removes the old software           *
*          if any is present and then it loads the new software.         *
*                                                                        *
*          This process should take approximately 10 minutes to          *
*          complete.  Once you have begun the installation, please       *
*          DO NOT STOP IT or you will have a non-functional system!      *
*                                                                        *
* IMPORTANT: Please remove any magneto optical disk that may be          *
*            present in the drive before continuing.                     *
*                                                                        *
**************************************************************************
Application software for release: R3.0.0_L9_ will be installed.
Press Ctrl-C now to stop this installation. Or press any other key to
proceed with the installation.
```

Figure 8-26 Command Window

5.) As indicated, press any key to continue. The process is completely automated and provides you with messages as to its status. R2.1.1 Software and after provides the message in Figure 8-27.

At this point you just have to wait while the software loads (Approximately 7-8 minutes).


LoadSoftware
Ignore all pop-up message boxes during software install. They will be handled automatically. This window will disappear in a couple of minutes.
OK

Figure 8-27 R2.1.1 Software Message

NOTE: When the Information Window appears asking you to select OK, do nothing. This window will disappear automatically.

6.) When the process has completed, the window will turn dark red and you will see the following message in Figure 8-28.

```
****************************************
* The system will reboot in 5 seconds *
****************************************
```

Figure 8-28 Software Load Complete

7.) When it completes loading the system will reboot.

If possible while the system is rebooting remove the CD from the drive. If the CD is removed the system will automatically reboot into the applications software.

8-8-1 Loading Applications Software (cont'd)

If you didn't remove the CD, don't worry you will get a dialog box, like the one shown in Figure 8-29. The ME2.0 will change to reflect the currently installed software.

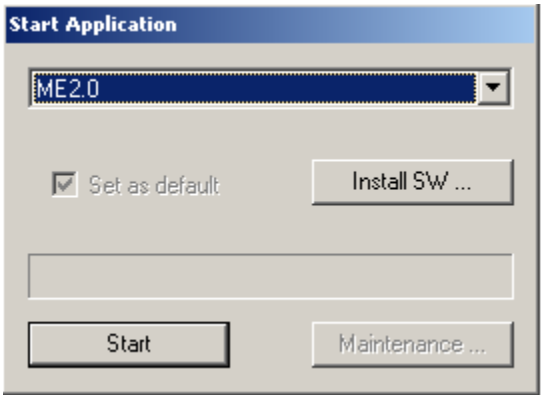


Figure 8-29 Start Software

8.) REMOVE the Applications CD

9.) From the Start Applications dialog box, select START.

10.) Select CANCEL.

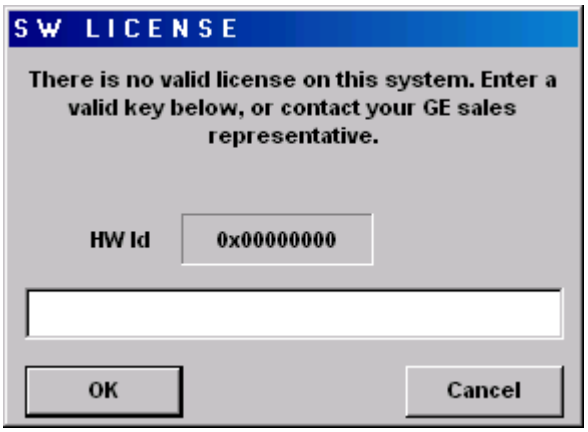

SW LICENSE
There is no valid license on this system. Enter a valid key below, or contact your GE sales representative.
HW Id
0x00000000
OK
Cancel

Figure 8-30 Enter Option String

11.) During the reboot process, the system may ask for the option string (valid license) to be entered. When this happens, enter the option string provided in the installation paperwork.

NOTE: Starting with R3.x Software, all systems must have at least the basic option string in order for the software to run. Any single option string may enable multiple options (i.e. Basic & B-Flow).

Demo option strings turn on all options for a limited period of time. Do Not leave a demo option string in a unit when it is sold to a customer. The current R3.x Demo Option String expires 31 January, 2005.

Section 8-9
Upgrading Application Software

8-9-1 Applications Software Upgrade Procedure

*NOTE: When installing software you may see error messages about not being able to replace the following *.dll files: **ginastub.dll** and **msvcr70.dll**. These are known, non-critical issues that are being tracked and will be fixed in the next revision of software.*

WARNING ***WHILE THE SOFTWARE INSTALL PROCEDURE IS DESIGNED TO PRESERVE DATA, YOU SHOULD SAVE ANY PATIENT DATA, IMAGES, SYSTEM SETUPS TO A MOD, CD, DVD OR HARDCOPY BEFORE DOING A SOFTWARE UPGRADE***

CAUTION **Remember to remove the MOD before continuing with the software install.**

1.) Place the “Application Software” CD into the CD-ROM/DVD drive.
2.) Power Down the scanner.
3.) Power up the scanner. Wait for a dialog box like the one in Figure 8-31.

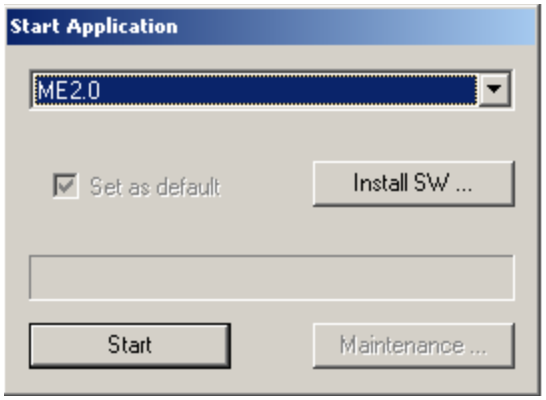


Figure 8-31 Start Application Window

8-9-1 Applications Software Upgrade Procedure (cont'd)

4.) Select INSTALL SW ... .

5.) There will be two dialog boxes popping up warning you that you are about to install new software as shown in Figure 8-32. In both cases click OK.

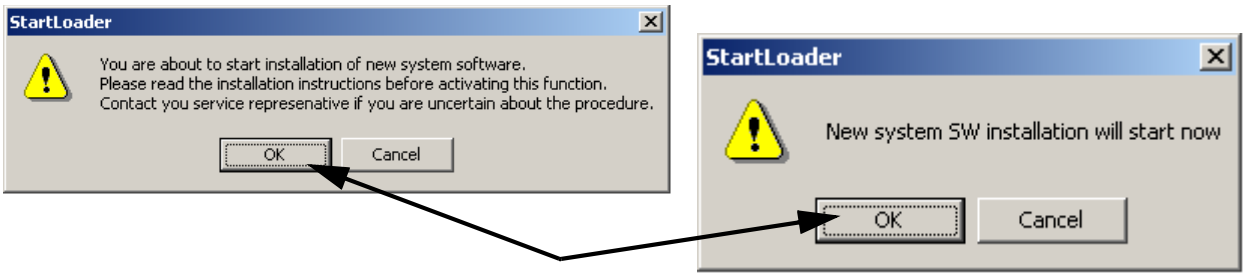

StartLoader
You are about to start installation of new system software.
Please read the installation instructions before activating this function.
Contact you service represenative if you are uncertain about the procedure.
OK
Cancel
StartLoader
New system SW installation will start now
OK
Cancel

Figure 8-32 StartLoader Dialog Boxes

```
**************************************************************************
* WARNING: This batch file installs the LOGIQ 9 application software *
*          onto your system. First it removes the old software       *
*          if any is present and then it loads the new software.     *
*                                                                    *
*          This process should take approximately 10 minutes to      *
*          complete.  Once you have begun the installation, please   *
*          DO NOT STOP IT or you will have a non-functional system!  *
*                                                                    *
* IMPORTANT: Please remove any magneto optical disk that may be      *
*            present in the drive before continuing.                 *
*                                                                    *
**************************************************************************
Application software for release: R2.3.0_L9_ will be installed.
Press Ctrl-C now to stop this installation. Or press any other key to
proceed with the installation.
```

Figure 8-33 Command Window

6.) Another window will be displayed asking you to "Press any key to continue…".

8-9-1 Applications Software Upgrade Procedure (cont'd)

7.) As indicated, press any key to continue. The process is completely automated and provides you with messages as to its status. R2.1.0 Software provides the message in Figure 8-34.


LoadSoftware
Ignore all pop-up message boxes during software install. They will be handled automatically. This window will disappear in a couple of minutes.
OK

Figure 8-34 R2.1.0 Software Message

At this point you just have to wait while the software loads (Approximately 10 minutes).

When the process has completed, the window will turn dark red and you will see the following message in Figure 8-35.



Figure 8-35 Software Load Complete

8.) When it completes loading the system will reboot.

9.) Remove the CD from the drive

If possible, while the system is rebooting remove the CD from the drive. If you didn't do that don't worry you will get a dialog box like the one shown in Figure 8-36.

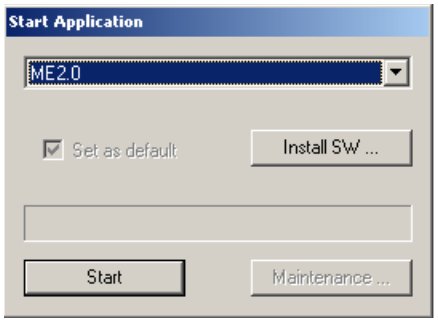


Figure 8-36 Start Software

10.)REMOVE the Applications CD

11.)From the Start Applications dialog box, select START.

12.)Select CANCEL.

8-9-1 Applications Software Upgrade Procedure (cont'd)

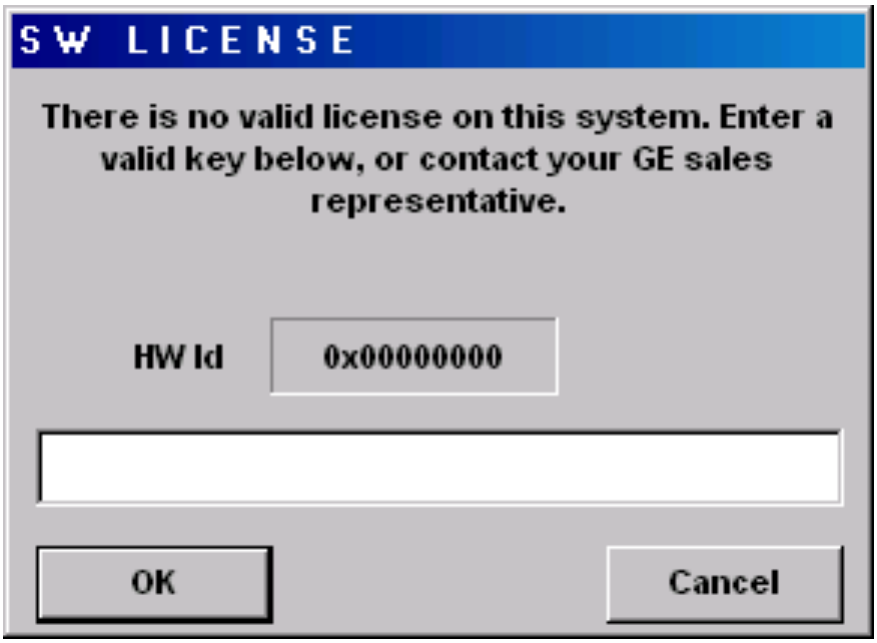

SW LICENSE
There is no valid license on this system. Enter a valid key below, or contact your GE sales representative.
HW Id
0x00000000
OK
Cancel

Figure 8-37 Enter Option String

13.) During the reboot process, the system may ask for the option string (valid license) to be entered. When this happens, enter the option string provided in the installation paperwork.

NOTE: Starting with R3.x Software, all systems must have at least the basic option string in order for the software to run. Any single option string may enable multiple options (i.e. Basic & B-Flow).

Demo option strings turn on all options for a limited period of time. Do Not leave a demo option string in a unit when it is sold to a customer. The current R3.x Demo Option String expires 31 January, 2005.

Section 8-10
System Setup

8-10-1 To Complete the System Setup

1.) From the Touch Screen on the scanner, select *Utility>Connectivity>TCPIP Tab*.

2.) Ensure that DHCP is deselected so you can enter information manually.

3.) Input the DICOM information.

* This should be the appropriate DICOM information for the system if it is on the hospital network. If it is not correct, input the correct data.

4.) After all information is entered select SAVE SETTINGS.

5.) iLinq Checkout will need to be completed again, refer to the iLinq Installation Manual.

8-10-2 VCR Setup

1.) Reset the VCR and choose a Default Line Printer by going to *Utilities>System>Peripherals*.

2.) Under VCR, Select *Sony 9500 VCR* and SAVE

3.) Under SETUP, Select the desired default line printer and SAVE

4.) Select *Exit* in the lower left-hand corner of the Touch Screen.

8-10-3 Printer Setup

1.) If the customer has a **USB (Digital) Printer** and it was plugged in at the time the Base Image Software was installed. It should have been recognized and automatically installed.

2.) If you did not install the printer until after the Applications software was loaded, you will need a service key (dongle) to get into windows and follow the manual set up procedures in the LOGIQ™ 9 Peripheral Installation Manual 2341053-100.

8-10-4 Print Key Assignment and Checkout

Because of the addition of more printer choices, digital and analog, the factory default print key configuration has been removed for the color and b/w printers.

1.) Determine which printers are configured on the system. The former factory defaults were Color = P3 and B/W = P2.

2.) Consult the customer to ensure which “Print” keys (P1-4) should be assigned to printers.

3.) Select Utility > Admin > Connectivity > Buttons >. Choose the desired print button. Under “Destinations”, select necessary printer choice from the drop-down list.

4.) Press the print key just configured and you should get a printout of the screen.

Section 8-10 System Setup (cont'd)

8-10-5 Restore Patient, Report, and User-Defined Presets

1.) Place the Backup/Restore media (MOD or CD-R) in the drive.

2.) Select the UTILITY tab on the Touch Panel. Select SYSTEM, then BACKUP/RESTORE.

The Backup/Restore screen is displayed.

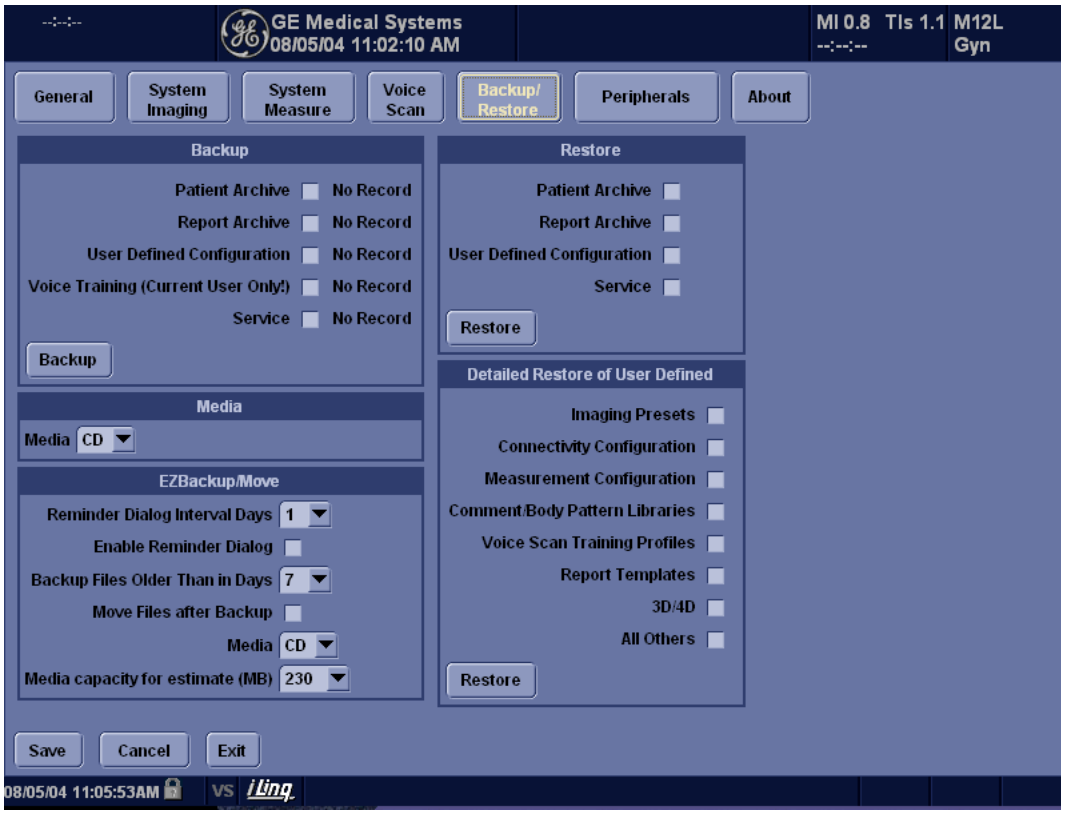


Figure 8-38 Backup / Restore Screen

NOTE: If you are not logged in with administrator privileges, the Operator Login window is displayed. Log on with administrator privileges.

8-10-5 Restore Patient, Report, and User-Defined Presets (cont'd)

3.) In the Restore list, select from the following, depending on which configurations you want to restore:

- Patient Archive
- Report Archive
- User Defined Configuration
- Service (Only available with R4.x.x SW and higher)

OR, in the Detailed Restore section select one of the following:

- • Imaging Presets
- • Connectivity Configuration
- • Measurement Configuration
- • Comment/Body Pattern Configuration
- • Voice Scan Training Profiles
- • Report Templates
- • 3D/4D (Only available with R4.x.x SW and higher)
- • All Others

NOTE: Only restore the Service presets onto the system from which they were backed up. Do not carry Service presets from one system to another.

4.) In the Media field, select the media that the backup is on.

5.) Select Restore.

The system performs the restore. As it proceeds, status information is displayed on the System/Backup/Restore screen.

NOTE: If you restore Service there is another progress bar that comes up during restore. When you do a restore, the system will automatically reboot. This only occurs after the boot where you restore Service. After this progress bar goes away the system will load normally. The progress bar will complete several full passes. This is normal.

Section 8-10 System Setup (cont'd)

8-10-6 Cycle System Power

1.) Do an auto-shut down
2.) Press the **ON/OFF** switch on the Control Panel once to display the SYSTEM - EXIT menu.
3.) Select SHUTDOWN from the SYSTEM - EXIT menu.

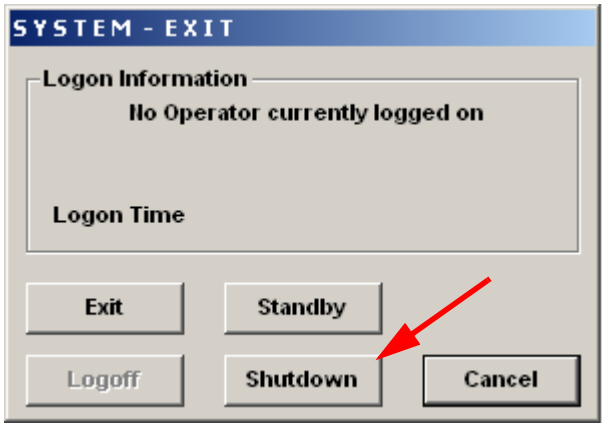


Figure 8-39 System Exit Menu for Back-end Processor Power Down

4.) Power up the system for functional check-out.

Section 8-10 System Setup (cont'd)

8-10-7 Standby Operation Checkout

To place the system in the Standby mode:

- Press the On/Off Switch, select "Standby" and select "OK".
- Wait approximately 30 seconds. The system should be in Standby mode. Both display screens are black and the On/Off switch indicator is green.

To wake the system from Standby mode:

- Press On/Off switch **QUICKLY**! Less than .25 seconds. If you press the On/Off switch too long the system will shutdown. It takes about 45 seconds for the system to become fully functional.

NOTE: Waking the system from Standby without AC connected will turn off the system.

NOTE: Standby mode is good for approximately 12-15 minutes.
The system will "beep" while in Standby Mode if AC power is removed (unplugged).

NOTE: Charge time for batteries is approximately 4 hours.

8-10-8 Functional Checkout

Refer to the customers "Quick Guide" to preform a functional checkout.

Table 8-1 Quick Guide Direction Numbers

Application Software Version	Direction Number
R2.X	2309820-100
R3.X	2384458-100
R4.X	5113779-100

Section 8-11
Console Lock Assembly Replacement Procedure

8-11-1 Manpower

One person, 1 hour

8-11-2 Tools

Hexagon key 2,5 and 3 mm

Phillips screwdriver size 2

Socket 8 mm

8-11-3 Preparations

1.) Shut down the system .
2.) Remove Operator Panel.
3.) Remove XY- Handle .

8-11-4 Console Lock Assembly Removal Procedure

1.) Unscrew 8 (5 mm) and 2 (3 mm) hexagon screws .
2.) Take care of the spring.
3.) Remove the Console Lock Assembly.

8-11-5 Console Lock Assembly Installation Procedure

1.) Install the Lock Assembly.
2.) Install the spring.
3.) Fasten the 10 hexagon screws.
4.) Install Operator Panel.

Section 8-12
Release Lock Assembly Replacement Procedure

8-12-1 Manpower

One person, 1 hour

8-12-2 Tools

- Hexagon key 2,5 and 3 mm
- Phillips screwdriver size 2
- Socket 8 mm

8-12-3 Preparations

1.) Shut down the system .
2.) Remove Operator Panel .
3.) Remove XY- Handle .

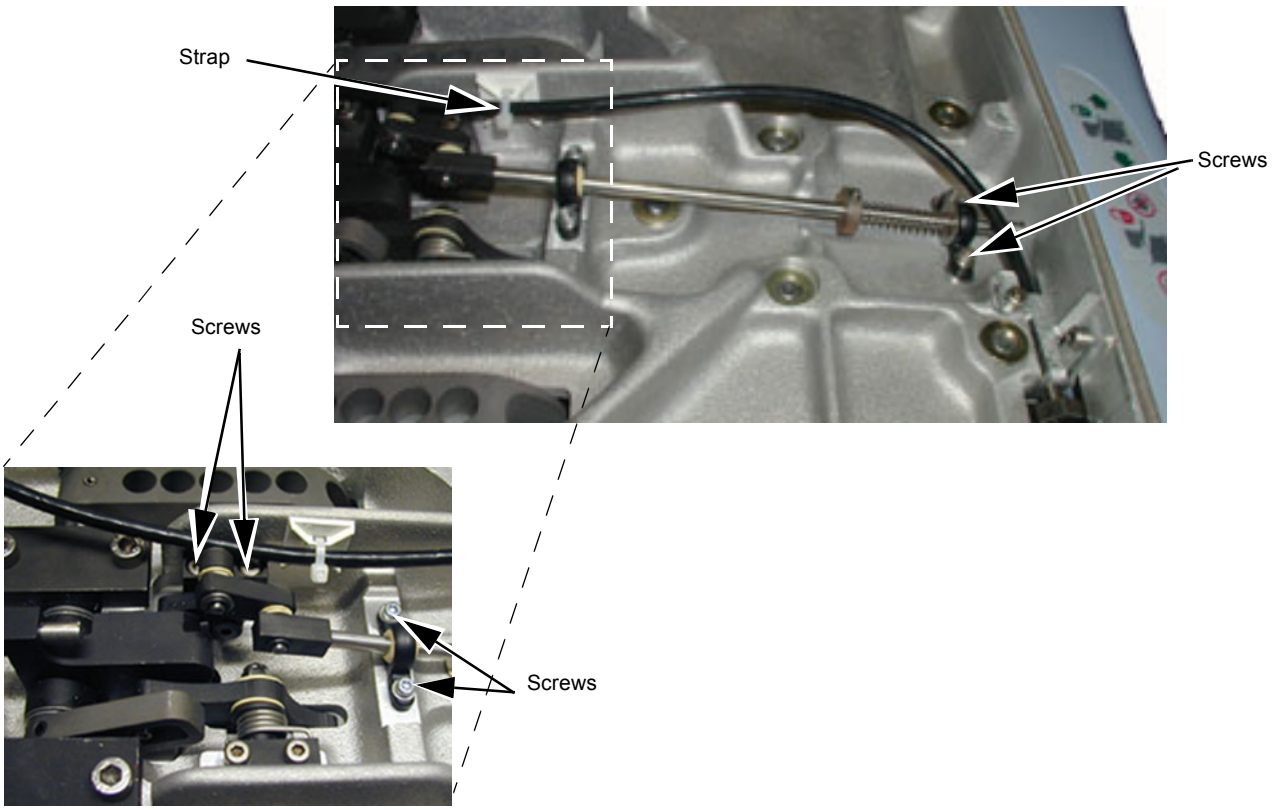


Figure 8-40 Release Lock Assembly

8-12-4 Release Lock Removal Procedure

1.) Unscrew 8 mm nut behind XY-Handle.
2.) Unscrew 2 hexagon screws (3 mm).
3.) Unscrew 4 hexagon screws (2,5 mm).
4.) Remove Release Lock Assembly.

8-12-5 Release Lock Installation Procedure

1.) Install Release Lock Assembly.
2.) Fasten 6 hexagon screws.
3.) Fasten nut behind XY- Handle.
4.) Install XY-Handle .
5.) Install Operator Panel.

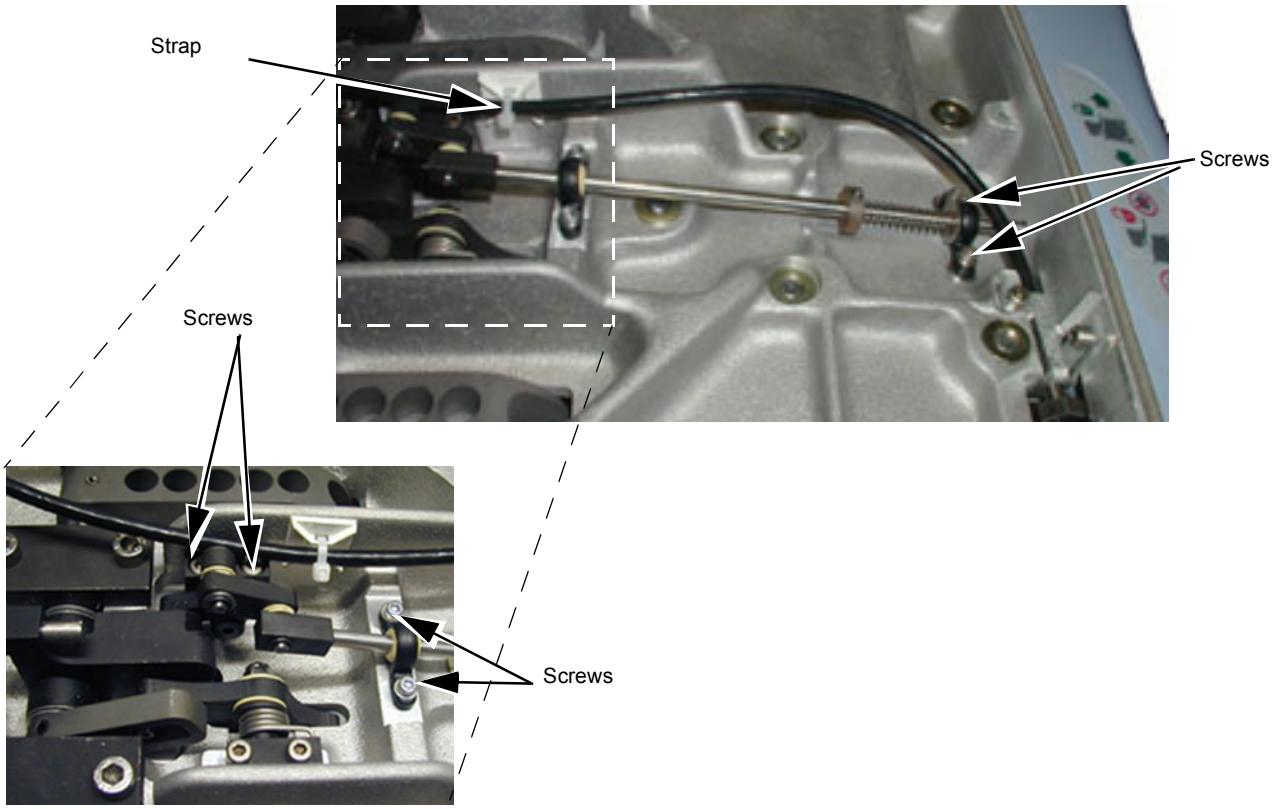


Figure 8-41 Release Lock Assembly

Section 8-13
Gas Shock Replacement Procedure

8-13-1 Manpower

2 persons, 4 hours

⚠ **WARNING** ***Tilting the console requires two people in order to avoid injury to service personnel and damage to the equipment.***

⚠ **WARNING** ***Beware of possible sharp edges on all metal chassis parts. if sharp edges are encountered, the appropriate PPE should be used to reduce the risk of injury.***

8-13-2 Tools

Large coin and a large flat screwdriver

Phillips screwdriver

Long Phillips driver

#2 Phillips screwdriver

5 mm Hexagon key

8-13-3 Overview

Replacement of the gas shock in a LOGIQ™ 9 is not a difficult task but one that should be approached with safety in mind.

The Gas Shock is used to balance the weight from the Top Console. It is located inside the frame, between the Front End Card Cage and the Back End Processor (BEP).

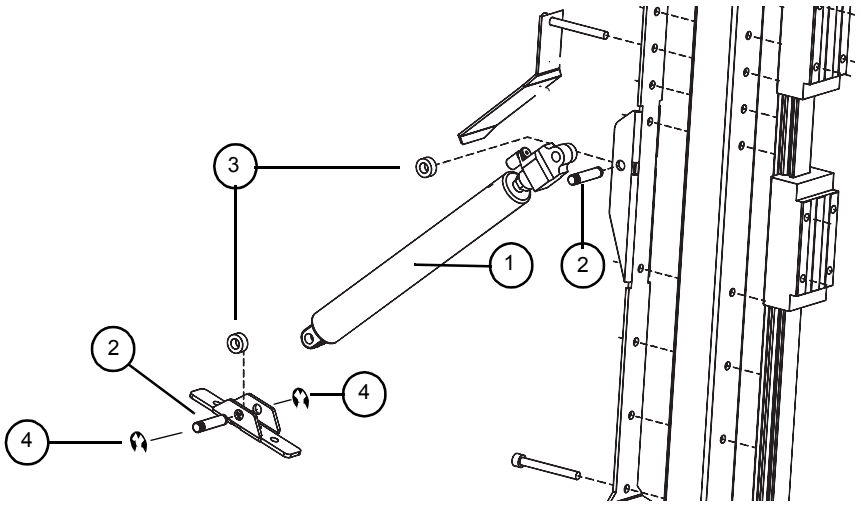


Figure 8-42 Typical Gas Shock Assembly

You get access to the Gas Shock via openings in the frame behind the BEP, so the BEP must be removed. To reduce the weight of the Top Console, the monitor should be removed.

To release the tension in the Gas Shock, the Top Console must be secured in its upper position during replacement.

Components must be removed to remove weight from the console and to gain access to the gas shock attachment points. Items removed are:

- Covers
- Handle
- Air Filter
- Peripherals
- VCR/Top Tray Frame
- Monitor
- Back End Processor (BEP)

Pay particular attention to all cautions and warnings in this procedure because injury could result from improper handling of components and sharp edges on metal chassis parts.

⚠ **WARNING** ***When the top console is in its locked position, the gas shock is compressed and stores mechanical energy. During normal operation the top console, the weight of the monitor and the mechanical force of the gas shock are in balance. Take care if/when you activate this gas shock. Personal injury can occur after the panel is removed and the shock pressure is released. Take care when you repair the elevation assembly.***

8-13-4 Preparations

1.) Power Off / Shutdown the system.
2.) Remove the left- and/or right-side covers.
3.) Remove the upper rear cover.
4.) Remove the top cover.
5.) Remove the front cover.
6.) Remove the lower rear cover.
7.) Remove the rear handle.
8.) Remove the back-end processor
9.) Remove the monitor assembly.
10.) Remove the color video printer.
11.) Remove the black and white video printer.
12.) Remove the VCR.

8-13-5 Top Tray Frame

The Color Printer/Top Tray Frame should be remove to avoid damage to this part.

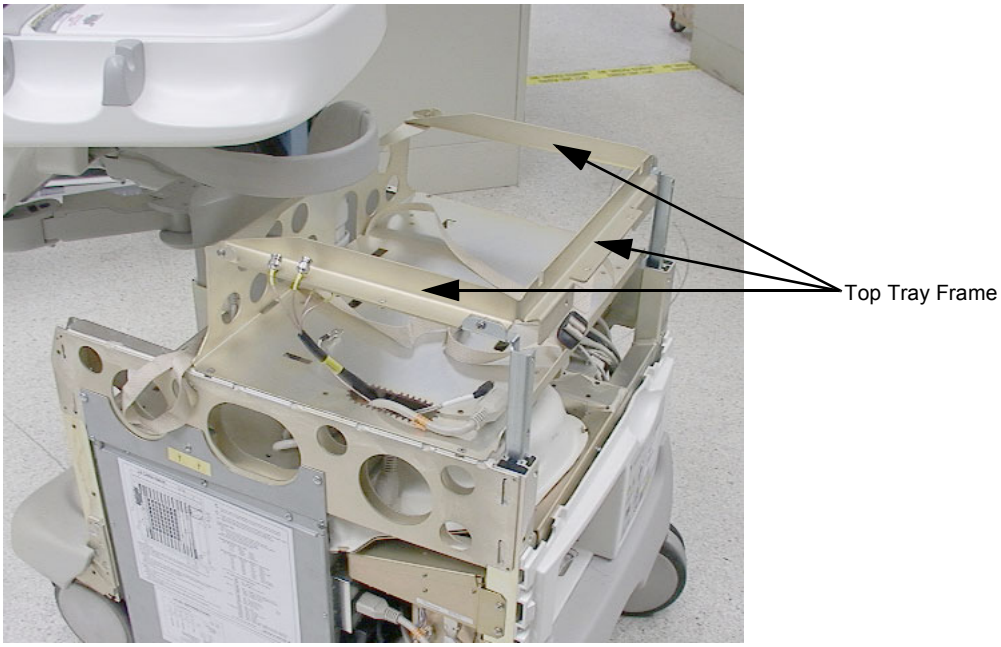


Figure 8-43 Color Printer/Top Tray Frame

8-13-5-1 Removal Procedure

1.) Remove the four screws securing the frame to the chassis.

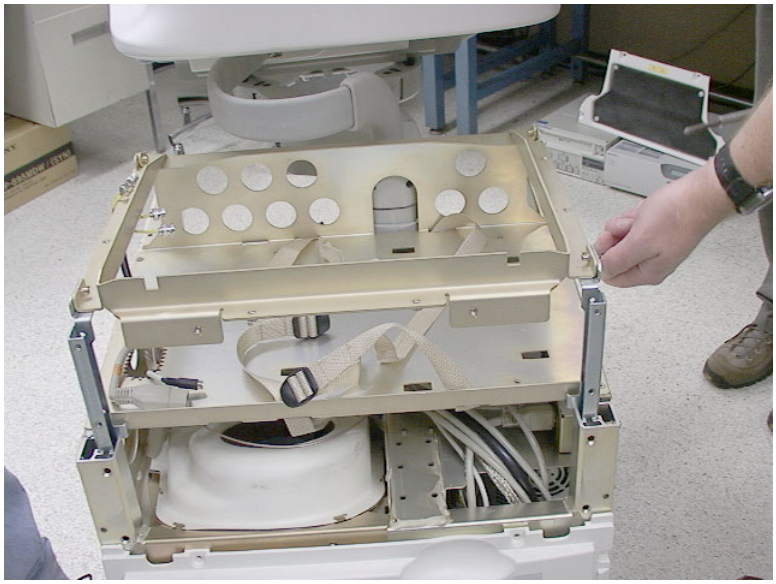


Figure 8-44 Remove Four Screws

2.) Remove the frame and set it aside.

You should now have a chassis with all the necessary parts removed as shown in Figure 8-45 on page 8-43 .

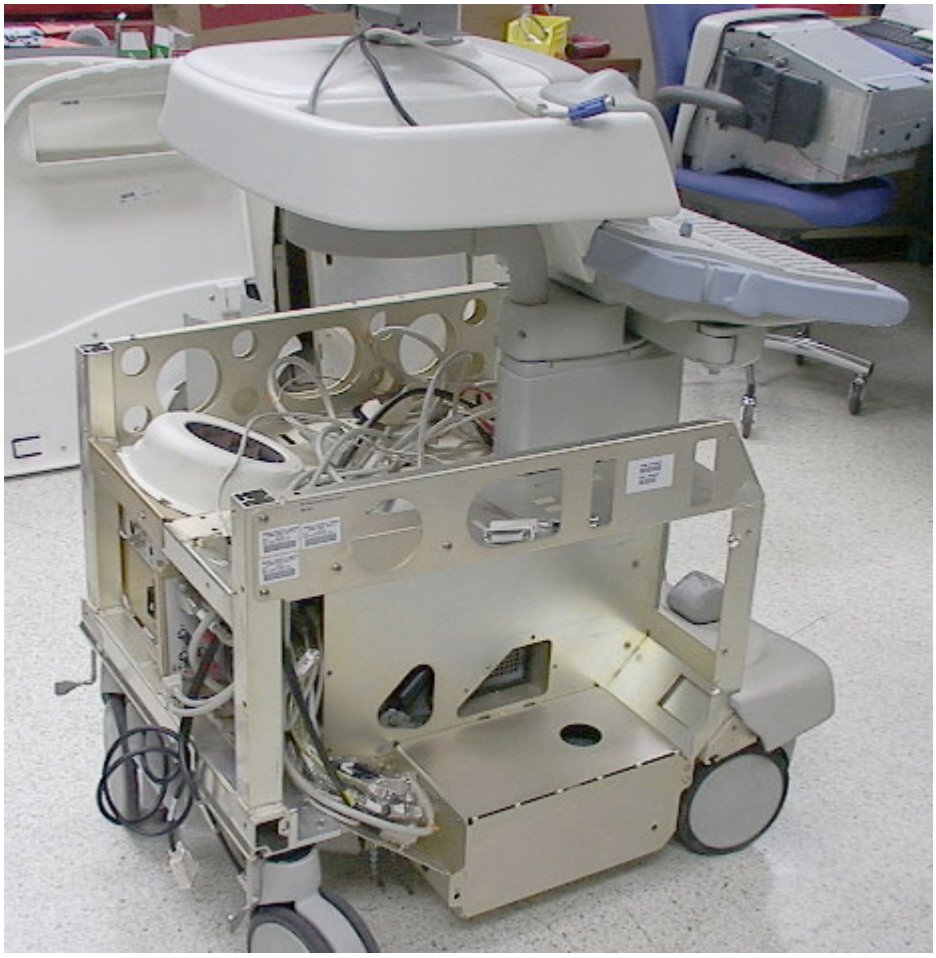


Figure 8-45 Chassis with Necessary Parts Removed

8-13-6 Gas Shock Removal

The stripped down system console will be tilted on it's side in order to remove and replace the gas shock.

1.) Set the back brake on the Right Side of the console. The right side is the side with the Front End Processor.

2.) Ensure that the keyboard X/Y motion ("Frogleg") is locked.

3.) Carefully raise the console to it's fully extended position.

⚠ **WARNING** ***Tilting the console requires two people in order to avoid injury to service personnel and damage to the equipment.***

4.) Place some padded material on the floor next to the right side of the chassis.

5.) Refer to Figure 8-46, with one person at the back of the chassis and one at the keyboard handles in the front, carefully tilt the console and lay it on it's right side.



Figure 8-46 Tilting the Console

6.) You should now have access to the top and bottom shock mounts as shown in Figure 8-47.

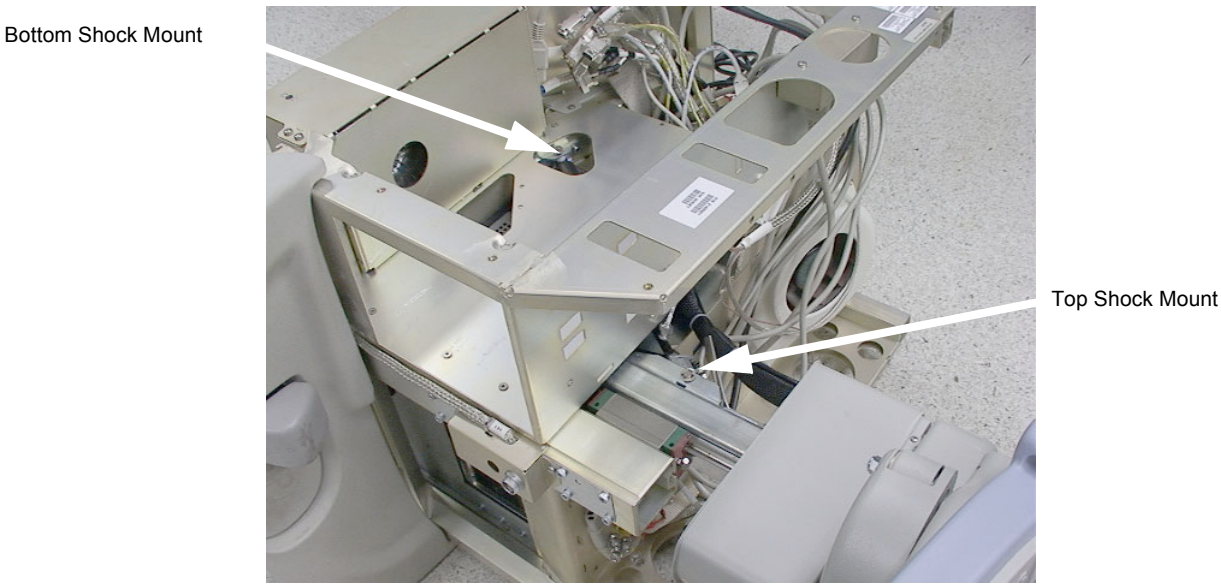


Figure 8-47 Console on It's Side

⚠ **WARNING** ***Beware of possible sharp edges on all metal chassis parts. if sharp edges are encountered, the appropriate PPE should be used to reduce the risk of injury.***

7.) At the top of the shock mount there is a Wire Clamp nestled in the Forked Retainer. Using 2 slotted screwdrivers (one on each side of the clamp) loosen the clamp. Refer to Figure 8-48.

8.) At the top shock mount remove the:

- Top "C" (Circlip) Clip
- Pin
- Bushings

Slide out the top shock end.

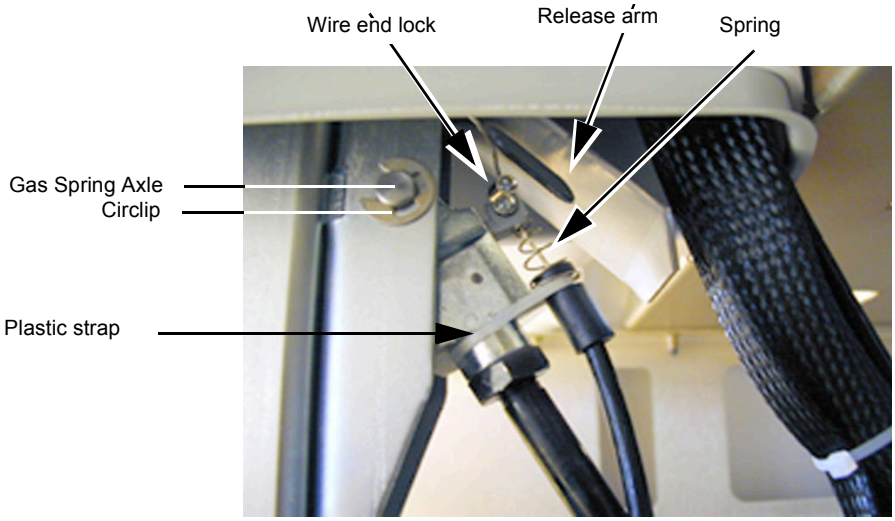


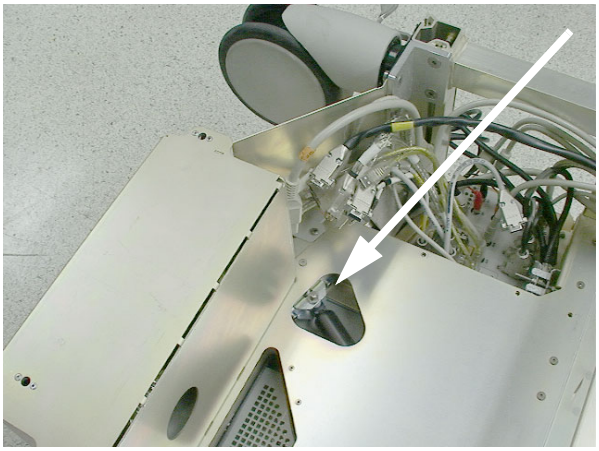
Figure 8-48 Upper Gas Shock Axle and Release Mechanism

9.) At the shock bottom mounting point, remove the Circlip. Refer to Figure 8-49.

10.)Remove the mounting axel and the washers. Refer to Figure 8-49.

NOTE: Take care, not to loose clips or washers.

11.)Lift up the bottom of the shock and pull it out and away from the pin.



Mounting Axel, Circlip and washers

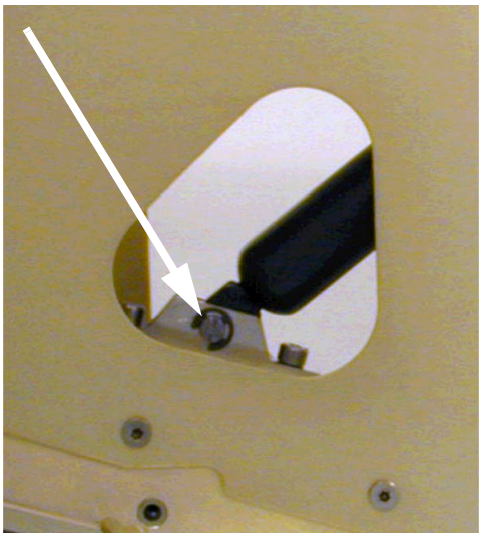


Figure 8-49 Bottom Shock Mount

8-13-7 Install the New Gas Shock

Reverse the removal procedure to install the new gas shock.



Figure 8-50 New Gas Shock as delivered

The shock comes pre-loaded with a “stop block” tywrapped to the top of the shock to prevent accidental complete extension of the shock. Refer to Figure 8-51. The Position of the release arm is also preadjusted.

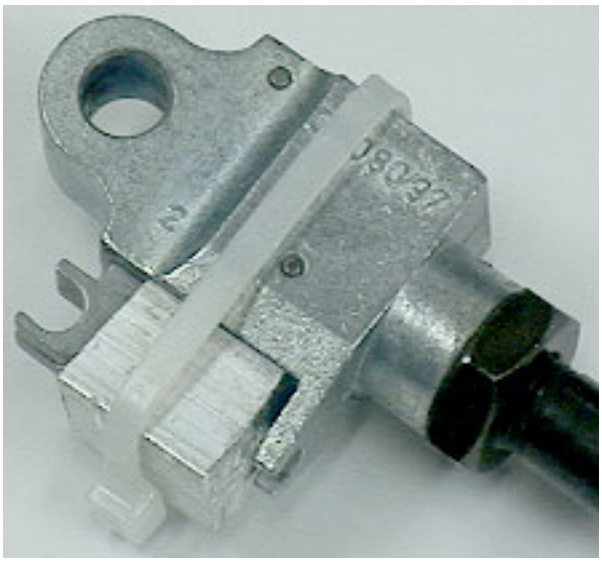


Figure 8-51 New Shock with Stop Block

1.) Slide the bottom of the shock into the bottom mount position as shown in Figure 8-52.

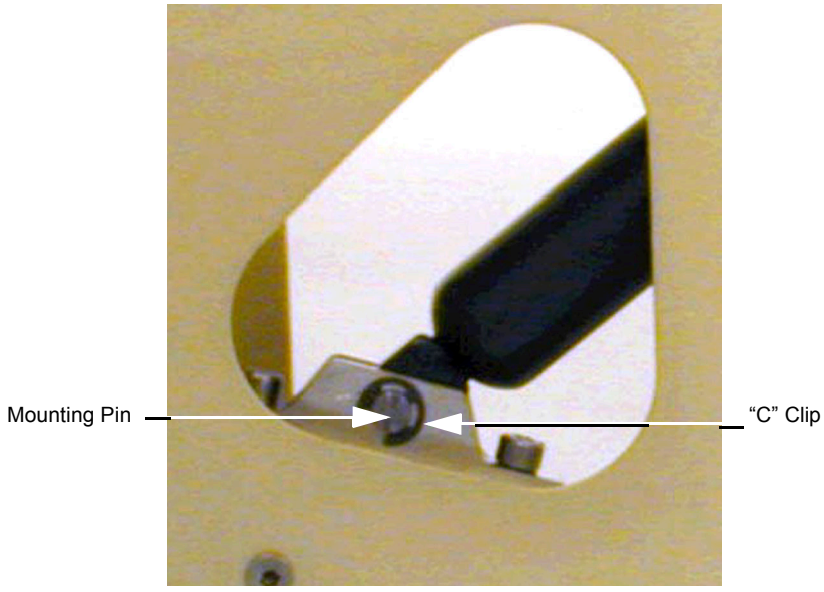


Figure 8-52 Shock Bottom Mounted

2.) Place a washer on each side of the bottom of the shock mount and align the holes as shown in Figure 8-52.

NOTE: You can use the top mounting pin to help align the bottom of the shock mount with the washers.

3.) Reach behind the bottom of the shock mount and lift the bottom mounting pin so that it slides through the washer, shock, washer and bottom mounting bracket as shown in Figure 8-52.

4.) Install the "C" clip to secure the bottom of the shock mount as shown in Figure 8-52.

5.) Move the top of the shock mount into position as shown in Figure 8-53.

6.) Assemble the top of the shock to the chassis using the pin, two washers and “C” clips as shown in Figure 8-53.

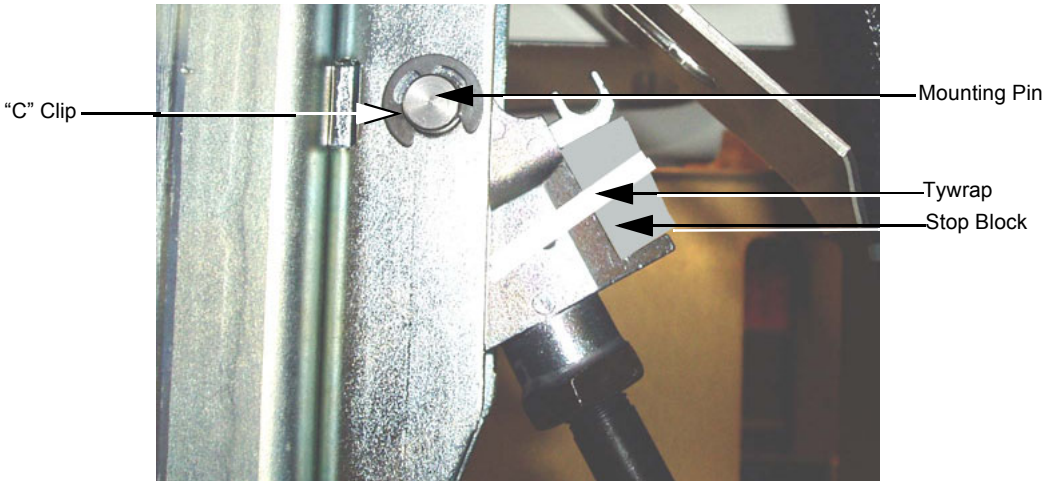


Figure 8-53 Top of Shock mounted

⚠ **WARNING** ***Tilting the console requires two people in order to avoid injury to service personnel and damage to the equipment.***

7.) Using two people, return the console to it’s upright position (sitting on all four wheels).

8.) Release the shock by cutting the tywrap and removing the stop block as shown in Figure 8-53.

8-13-8 Reassemble Z-Release

1.) Place the Release Cable Socket in the slot on the Shock top’s lower flange as shown in Figure 8-54.

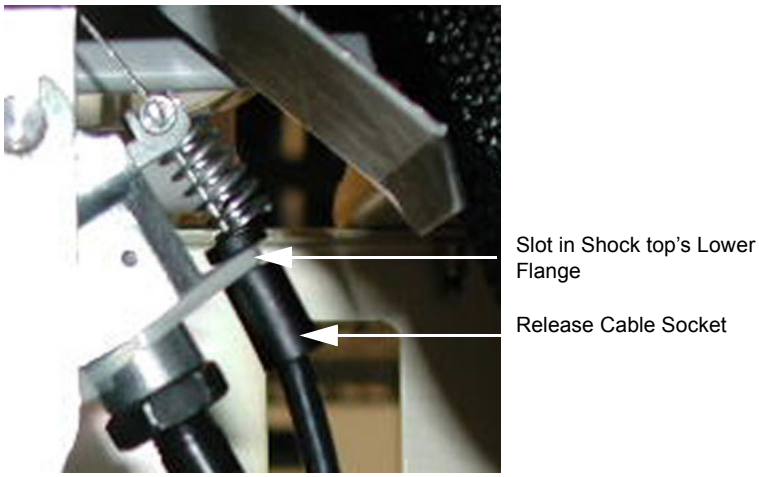


Figure 8-54 Mounting the Release Cable

2.) Tywrap the Release Cable Socket to the Shock head as shown in Figure 8-55.

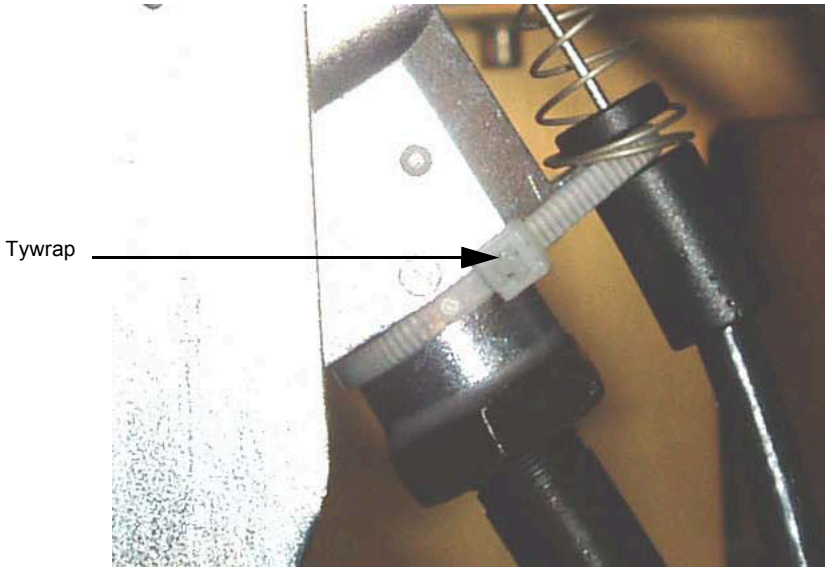


Figure 8-55 Tywrapped Release Cable

3.) Thread the spring and barrel clamp(s) onto the Release Cable wire. Place the Barrel Clamp(s) in the Clamp cradle on the Shock's Valve Release arm as shown in Figure 8-56.

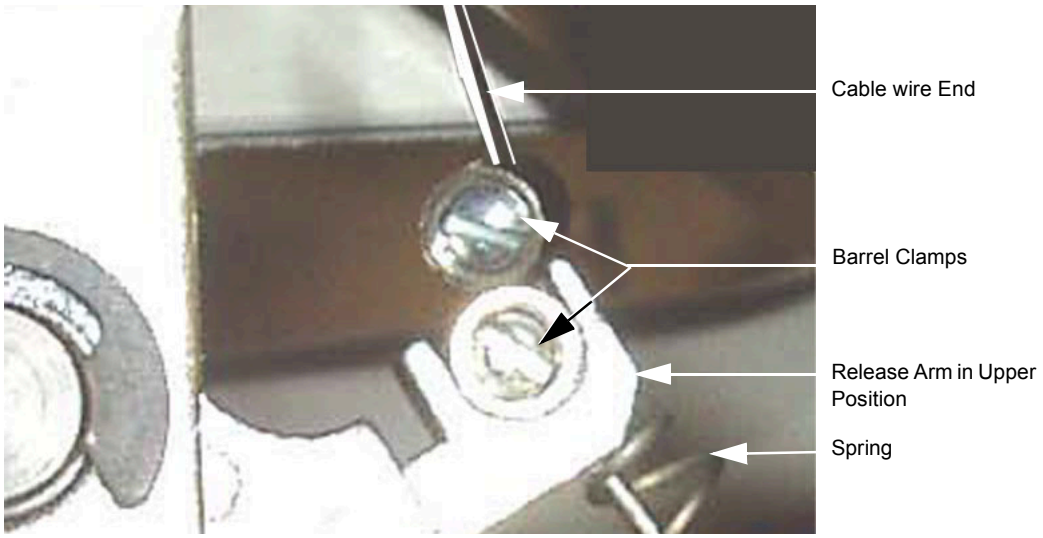


Figure 8-56 Cradled Barrel Clamps

4.) Using needle nose pliers, hold the wire end shown in Figure 8-56 above the clamp(s) and pull it upward to take up any cable slack.

5.) Using one of the two slotted screwdrivers, push the Clamp(s) downwards until it rests in the Shock Valve Release Arm Clamp Cradle as shown in Figure 8-56.

⚠ **WARNING** ***Do NOT attempt to pinch together or pry apart the Cradle. If one of the tines should break off, the gas spring piston may have to be replaced AGAIN.***

6.) Tighten the clamp with one screwdriver to hold the cable. Let go of the pliers and then use the two screwdrivers to fully tighten the clamp.

7.) Without squeezing the Top Console Release Lever, check that the Shock Valve Release Arm is in its uppermost position as shown in Figure 8-56.

8.) Squeeze the Top Console Release Lever and watch the clamp cradle move down immediately as the lever is squeezed, there should be very little play in the cable. Small amounts of play can be taken up (or slackened) with the Top Console cable adjustment screw.

NOTE: Before installing the Back End Processor, check all connections to the AC Transformer box to ensure they were not disturbed while replacing the gas shock.

9.) Replace the BEP. Refer to Chapter 8 of the Proprietary Manual if necessary.

10.) Replace the Monitor. Refer to Chapter 8 of the Proprietary Manual if necessary.

11.) You should now be able to power up the system and check basic operation prior to installing the peripherals and covers. If the system functions normally, continue reassembling the system.

12.) After completing a basic check out, power down the system.

13.) Replace the Color Printer/Top Tray frame.

14.) Replace the VCR.

15.) Replace the B/W.

16.) Replace the Color Printer.

17.) Replace all covers.

- Air Filter
- Handle
- Top Cover
- Back Covers (Top & Bottom)
- Front Cover
- Filter Cover
- Side Covers

18.) Power up the system and do a complete functional check of all functions and peripherals.

19.) Check the Z-Release operation (Operator Console up/down operation). Readjust if necessary. Refer to Section 6-5 "Z-Release Cable and Gas Spring Adjustment" on page 6-6.

Section 8-14
Frog Leg Angle Adjustment

8-14-1 Manpower

Two persons, .5 hour + travel

8-14-2 Tools

Hexagon keys, 5mm and 6 mm

8-14-3 Kit Contents

Table 8-1 Shim Kit - LOGIQ™ 9 or Vivid 7 Op Panel (5116529)

Qty	Description
2	Shim Washer .635 mm thick
1	Shim Washer 1mm thick

8-14-4 Preparations

1.) Power Off / Shutdown the system.
2.) Remove the monitor.

8-14-5 Frog Leg Adjustment Procedure

1.) Return the console to the locked position and engage the X-Y Lock.
2.) Carefully raise the console to it's fully extended position.
3.) Have one person hold on to the rear of the operator panel. See Figure 8-57 on page 8-51 .



Figure 8-57 Hold on to Rear of Operator Console

NOTICE *Lock Tight is applied to the hex screws that attach the Operator Console to the Frogleg during assembly. Be sure to seat the Hexagon Key firmly in the screw before attempting to unscrew so that you don't strip the screw head.*

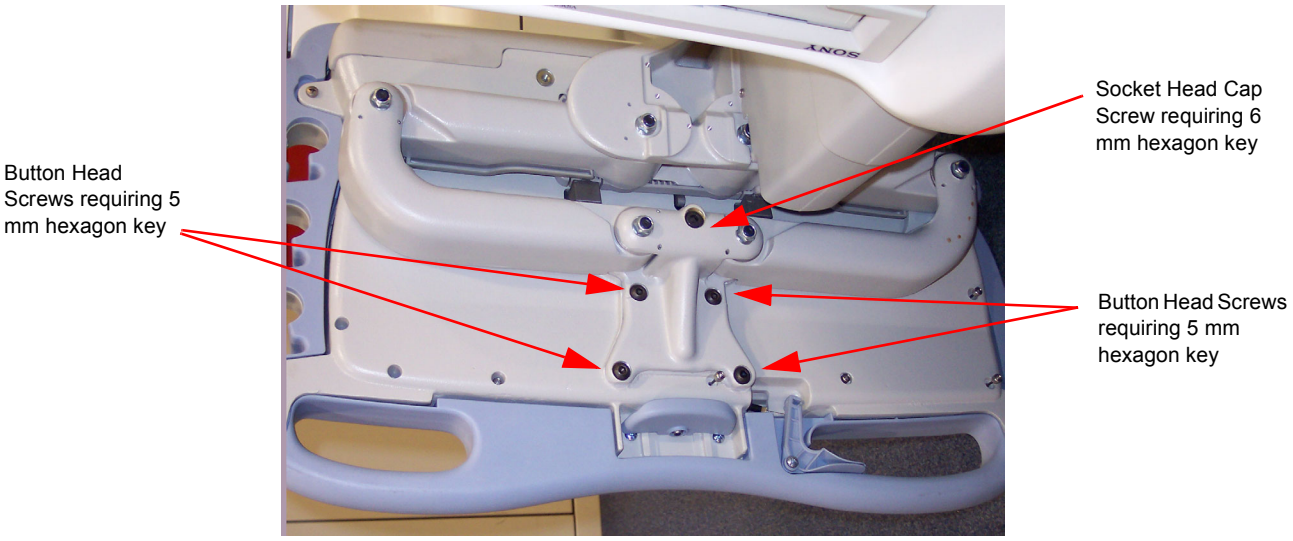

Button Head Screws requiring 5 mm hexagon key
Socket Head Cap Screw requiring 6 mm hexagon key
Button Head Screws requiring 5 mm hexagon key

Figure 8-58 Screws through Frogleg to Top Console

4.) Unscrew and remove socket head cap screw from Top Console. See Figure 8-58 on page 8-52 and Figure 8-59 on page 8-52 .

5.) Unscrew and remove four button head screws from Top Console. See Figure 8-58 on page 8-52 and Figure 8-59 on page 8-52 .



Figure 8-59 Remove Screws

6.) Have person holding the Operator Console gently tip it back. See Figure 8-60 on page 8-53 .

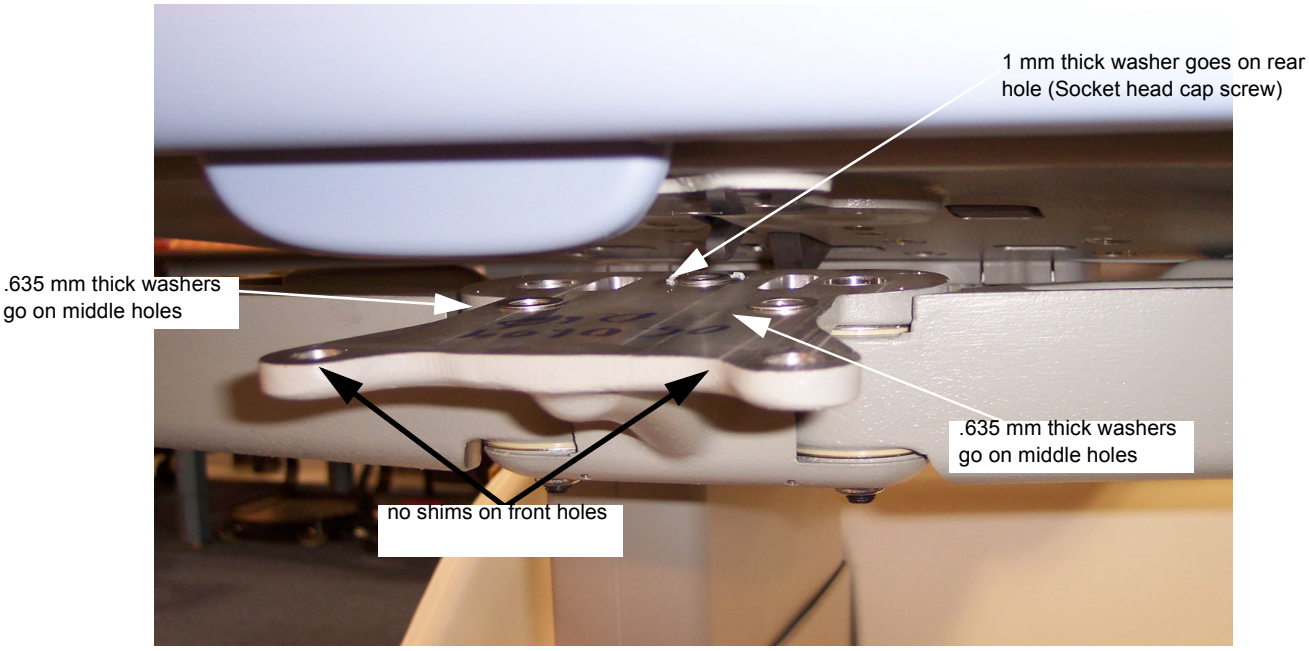

1 mm thick washer goes on rear hole (Socket head cap screw)
.635 mm thick washers go on middle holes
.635 mm thick washers go on middle holes
no shims on front holes

Figure 8-60 Place Washers (shims) on Frogleg

7.) Place 1 mm thick washer between Frogleg and Top Console so the socket head cap screw can be inserted through it. See Figure 8-60 on page 8-53 .

8.) Place the two .635 mm thick washers between the Frogleg and Top Console assembly so the middle button head screws can be inserted through them. See Figure 8-60 on page 8-53 .

9.) Have person holding the Operator Console gently tip console back into place.

10.) Install socket head cap screw using care not to cross thread the casting.

11.) Install all button head screws, using care not to cross thread the casting.

12.) Tighten all five screws.

13.) Replace the monitor.

8-14-6 Functional Check

1.) Close Frog Leg.

2.) Verify "Crash Arms" extend at least 1/2 way down "Crash Pads". See Figure 8-61 on page 8-54 and Figure 8-62 on page 8-54 .

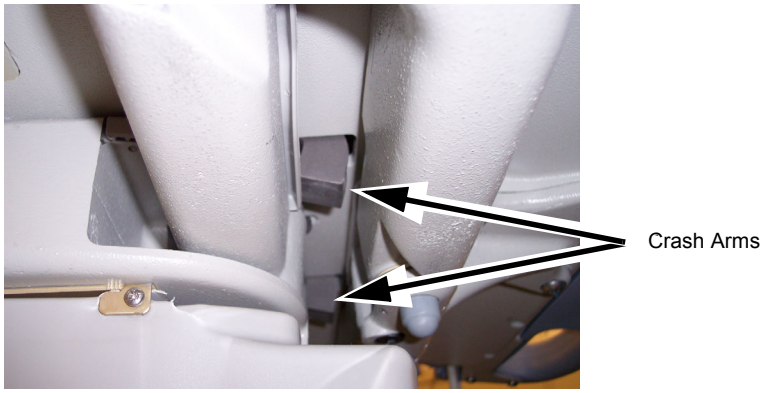


Figure 8-61 Crash Arm

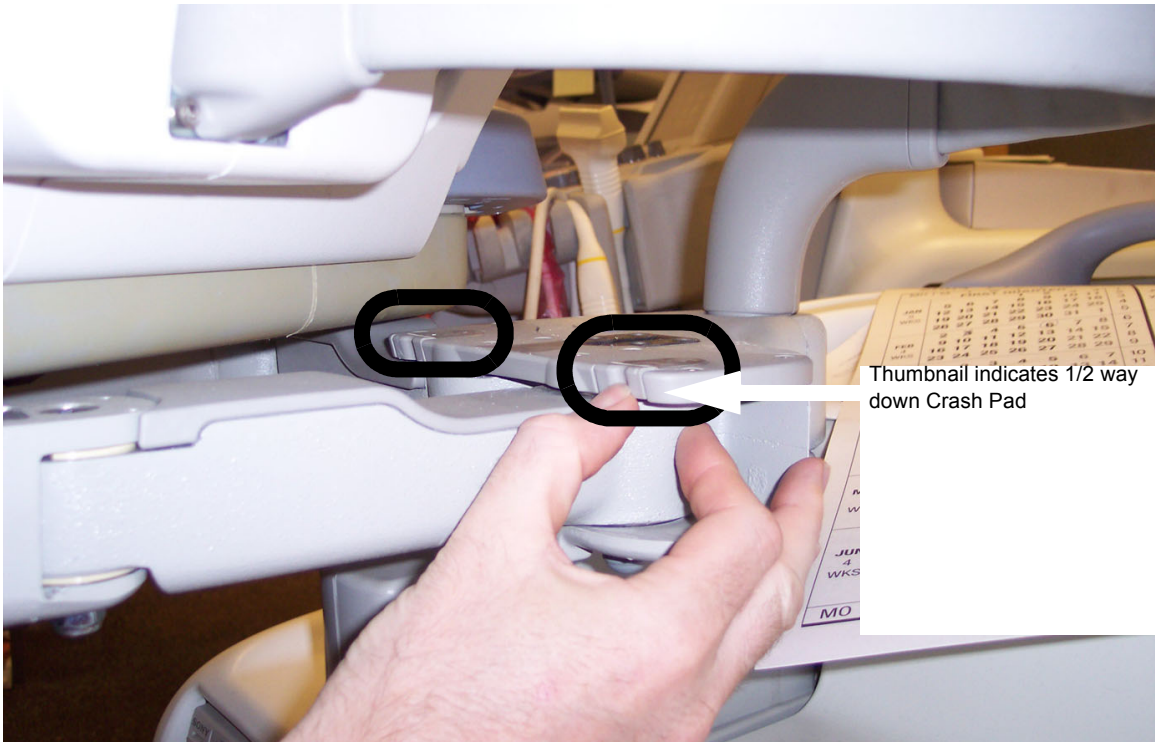


Figure 8-62 Crash Pad

3.) Lock and Unlock Frogleg to verify correct operation.

NOTE: If the frogleg continues to rub on the operator panel after the shims have been put in place, or if the crash arms do not extend at least 1/2 way down the crash pads, you will need to order a new frogleg.

Chapter 9
Renewal Parts

Section 9-1
Overview

9-1-1 Purpose of Chapter 9

This chapter gives you an overview of Spare Parts available for the LOGIQ™ 9.

Table 9-1 Contents in Chapter 9

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9-12	I/O Interfaces	9-22
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9-24	Probes	9-56

9-1-2 LOGIQ™ 9 Models Numbers

Table 9-2 LOGIQ™ 9 Model Designations

Part Number	Description
2188900	LOGIQ™ 9 120 V Console & Peripherals - BEP1.0
2188900-2	LOGIQ™ 9 240V Console & Peripherals - BEP1.0
2188900-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP1.0
2188900-4	LOGIQ™ 9 120 V Console & Peripherals - BEP2.0
2188900-5	LOGIQ™ 9 240V Console & Peripherals - BEP2.0
2188900-6	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.0
2351100	LOGIQ™ 9 120 V Console & Peripherals - BEP2.1 BT'02
2351100-2	LOGIQ™ 9 240V Console & Peripherals - BEP2.1 BT'02
2351100-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.1 BT'02
2375600	LOGIQ™ 9 120 V Console & Peripherals - BEP2.2 BT'03
2375600-2	LOGIQ™ 9 240V Console & Peripherals - BEP2.2 BT'03
2375600-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP2.2 BT'03
2404587	LOGIQ™ 9 120 V Console & Peripherals - BEP3 BT'04
2404587-2	LOGIQ™ 9 240V Console & Peripherals - BEP3 BT'04
2404587-3	LOGIQ™ 9 120V Console & 240V Peripherals - BEP3 BT'04

Section 9-2
List of Abbreviations

- Assy - Assembly
- BEP - Back End Processor
- Ctrl - Control
- FEP - Front End Processor
- F.O.B - Flock of Birds or 3-D Option
- FRU 1 - Replacement part available in parts hub
- FRU 2 - Replacement part available from the manufacturer (lead time involved)
- LCD - Liquid Crystal Display
- Int -Internal
- I/O - Input/Output
- PWA - Printed Wire Assembly
- Recv - Receive
- XFRMR - Transformer

Section 9-3
Parts List Groups



Left Front Rear Right

Figure 9-1 Console Views

Table 9-3 Parts Groups

Group	Part Group Name	Table Number	Description
100-	External Covers	Table 9-4	External covers and cavity fillers
140-	Additional Console Hardware	Table 9-5	
170-	Operator I/O Mechanical Parts	Table 9-6	
250-	Monitor Assembly	Table 9-10	Monitor, Rear Cover, Front Bezel, Mounting, Tilt, Swivel
200-	Operator Control Panel Assembly - Upper	Table 9-11	User Interface: Keyboard Trackball, TGC Assy., Foot Pedal
400-	Front End Processor Assembly	Table 9-14	Xmit/Recv, Signal Pre-Processing, Control
300-	I/O Interfaces	Table 9-15	Front End/Back End Interface, BEP External Interface
450-	Back End Processor Assemblies	Table 9-17 Table 9-18 Table 9-19	
500-	Peripheral Cables	Table 9-21 Table 9-24 Table 9-25	
600-	Power Distribution	Table 9-26	
650-	Air Distribution Parts	Table 9-27	
800-	Customer Documentation	Table 9-33	
900-	Probes	Table 9-34	

Section 9-4
External Covers



Figure 9-2 External Covers

Table 9-4 External Covers

Item	Part Name	Part Number	Description	Qty	FRU
101	Top Cover	FB307383		1	1
102	Front Cover Assembly	FC200076	with Two Labels, Apply the Appropriate Label	1	1
103	Right Side Cover Assembly	FC200074	with bumper - *Same as Vivid 7* -	1	1
103A	Right Side Cover Assembly	FC200422	with bumper and GE Logo. If ordering to replace non-logo cover, also order FC200421 and replace set	1	1
104	Left Side Cover Assembly	FC200073	with bumper - *Same as Vivid 7* -	1	1
104A	Left Side Cover Assembly	FC200421	with bumper and GE Logo. If ordered to replace non-logo cover, also order FC200422 and replace set	1	1
105	Rear Cover Assembly	FC200077	with bumper - *Same as Vivid 7* -	1	1
106	Rear Filter Cover	FB200385	with brackets - *Same as Vivid 7* -	1	1
107	Footrest Bumper	FB307387		1	1
108	Color Printer Cavity Filler Insert	FB307990	- *Same as Vivid 7* -	1	1
109	B/W Printer Cavity Filler Insert	FB307989	- *Same as Vivid 7* -	1	1
110	VCR Cavity Filler Insert	FB307988	- *Same as Vivid 7* -	1	1
111	Filter Media	FB307903	Dust Filter - *Same as Vivid 7* -	1	1

Section 9-5
Additional Console Hardware

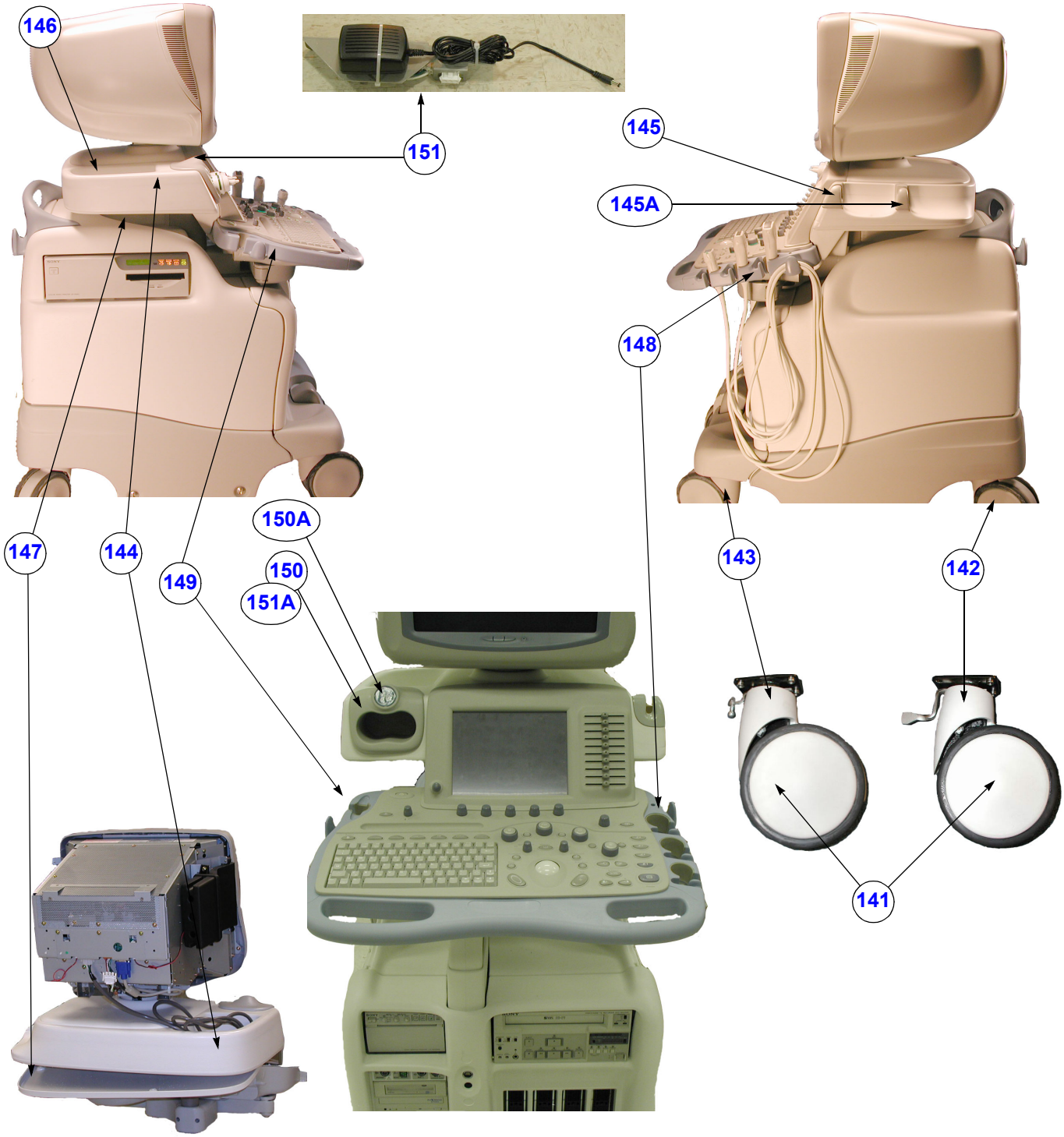


Figure 9-3 Additional Console Hardware

Table 9-5 Additional Console Hardware

Item	Part Name	Part Number	Description	Qty	FRU
141	Caster Hub Caps	2293008-5	Need to order 2 per caster, adhesive mounting	1	1
142	Rear Casters (wheels)	2293008-3	Does Not Have Pedal Activated Swivel Lock Assembly. Manual Swivel Lock *- Same as Vivid 7 -*	2	1
143	Front Casters (wheels)	2293008-2	Includes Swivel Lock Assembly *- Same as Vivid 7 -*	2	1
144	Shelf Cover	2291452		1	1
145	TV/TR Probe Holder Front	2291455		1	1
145A	TV/TR Probe Holder Rear	2299040		1	1
146	Pocket Shelf Mat	2291453		1	1
147	Under Shelf Cover	2291454		1	2
148	Right Probe Holder Assembly	2299038		1	1
149	Left Probe Holder Assembly	2299039		1	1
150	Gel Warmer Assembly * see note	2291461	*Need to order GE Logo Decal 2269030-15	1	1
150A	GE Logo Decal for Gel Warmer	2269030-15	Must order when replacing Gel Warmer	1	1
151	Gel Warmer Power Source	2329637	12VDC Power Source - Obsolete	1	N
151A	Gel Warmer Power Source	2329637-3	6VDC Power Source	1	1

Section 9-6
Operator I/O Mechanical Parts

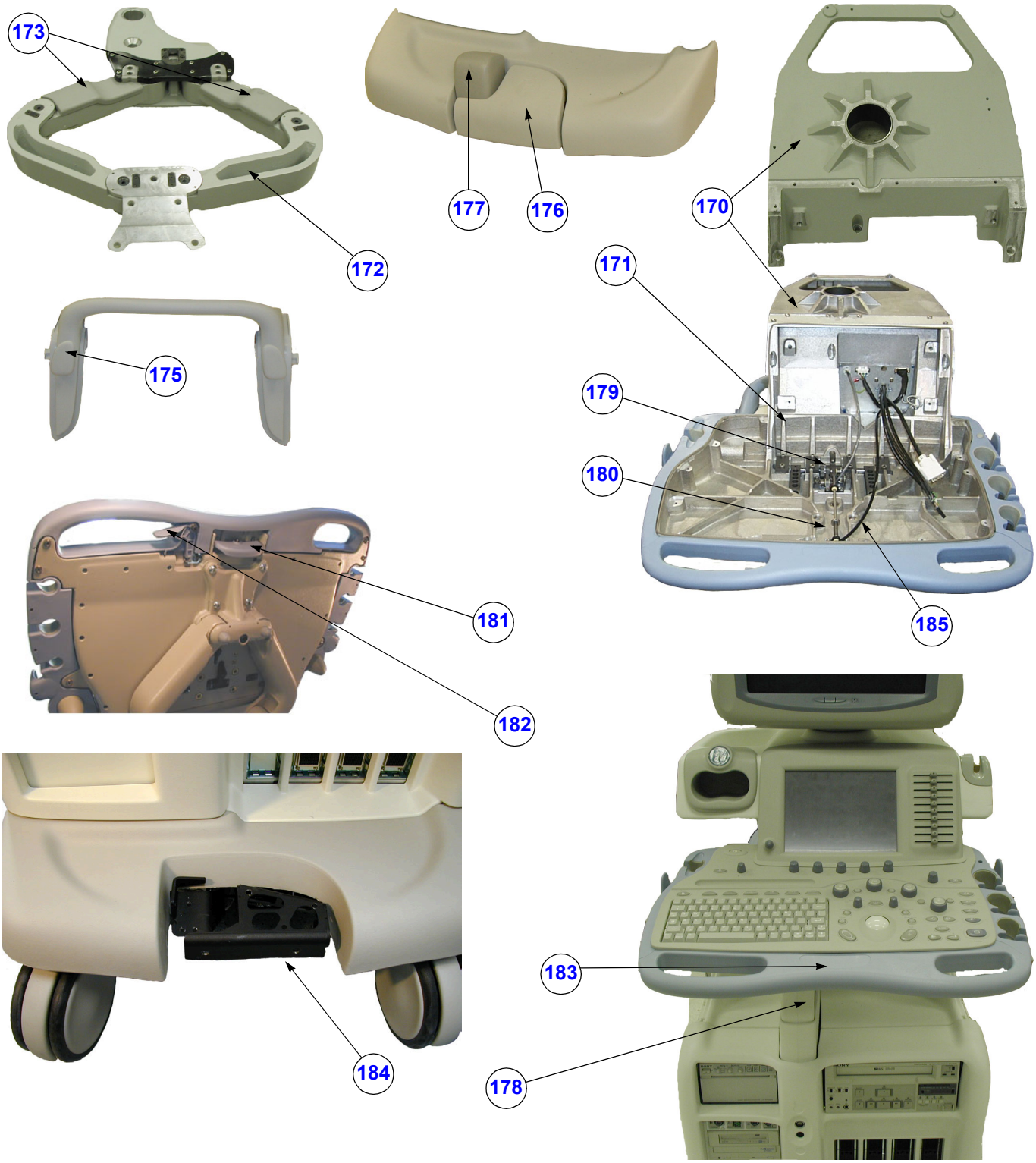


Figure 9-4 OP I/O Mechanical Parts

Table 9-6 Operator I/O Mechanical Parts

Item	Part Name	Part Number	Description	Qty	FRU
170	Top Console Upper Casting Assembly	2331665	Assembly for Service	1	2
171	Top Console Lower Casting Assembly	2331858	Assembly for Service	1	2
172	Frogleg (complete)	FB200340	*- Same as Vivid 7 -*	1	2
173	Frogleg Bumper Kit	FC200086	goes on back/top half of Frogleg arms *- Same as Vivid 7 -*	1	1
175	Rear Handle Assembly	FB200406	with cable wrap hooks - *Same as Vivid 7 -*	1	1
176	Brake Lock Pedal	FB307407	*- Same as Vivid 7 -*	1	1
177	Directional Lock Pedal	FB307409	Swivel Lock Pedal	1	1
178	Column Cover Kit	FC200088	*- Same as Vivid 7 -*	1	1
179	Top Console Lock Assembly	FB200350	*- Same as Vivid 7 -*	1	2
180	Lock Release	FB200920	*- Same as Vivid 7 -*	1	2
181	X-Y Release Handle	FB307297	*- Same as Vivid 7 -*	1	2
182	Z-Release Handle	FB307296	*- Same as Vivid 7 -*	1	2
183	Main Handle with Label	FC200131	Front Handle with Label in center	1	1
184	Pedal Assembly	FB200595	*- Same as Vivid 7 -*	1	1
185	Wire Cable, Gas Spring	FB307375	Wire used when operating vertical movement of Top Console - *Same as Vivid 7 -*	1	2
186	Frogleg Shim Kit	5116529	*Needed on some models to keep the frogleg from rubbing on the operator console Kit contains two .635 mm washers and one 1mm washer*	1	1

9-6-1 Bumper Kit, Frogleg

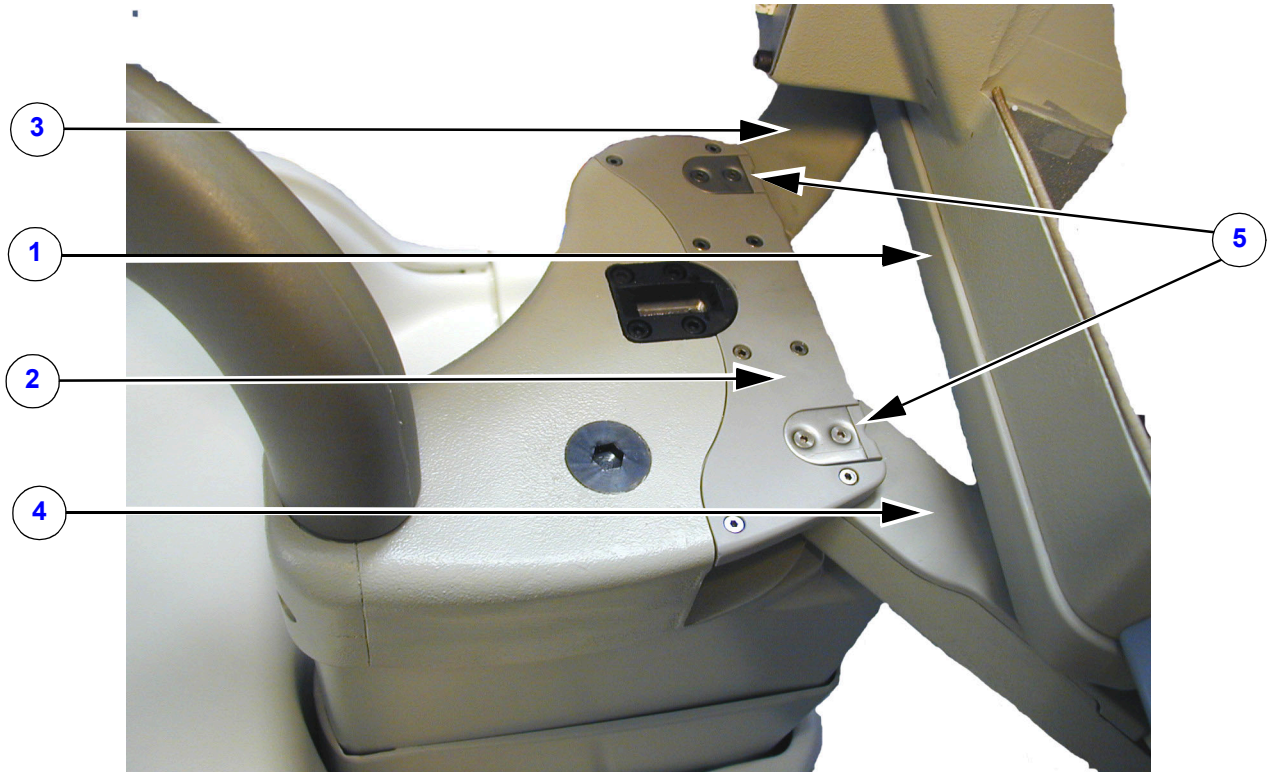


Figure 9-5 Bumper Kit, Frogleg, Base Seen From Above

Table 9-7 Bumper Kit, Frogleg FC200086

ITEM	PART NAME	PART NUMBER	DESCRIPTION	QTY	FRU
1	BUMPER CRASH PAD	-	Bumper Crash Rear	1	N
2	BUMPER INNER BOSS	-	-	1	N
3	BUMPER RIGHT FROGLEG	-	-	1	N
4	BUMPER LEFT FROGLEG	-	-	1	N
5	BUMPER INNER BOSS CRASH	-	-	2	N

Section 9-7
Operator Control Panel Brackets

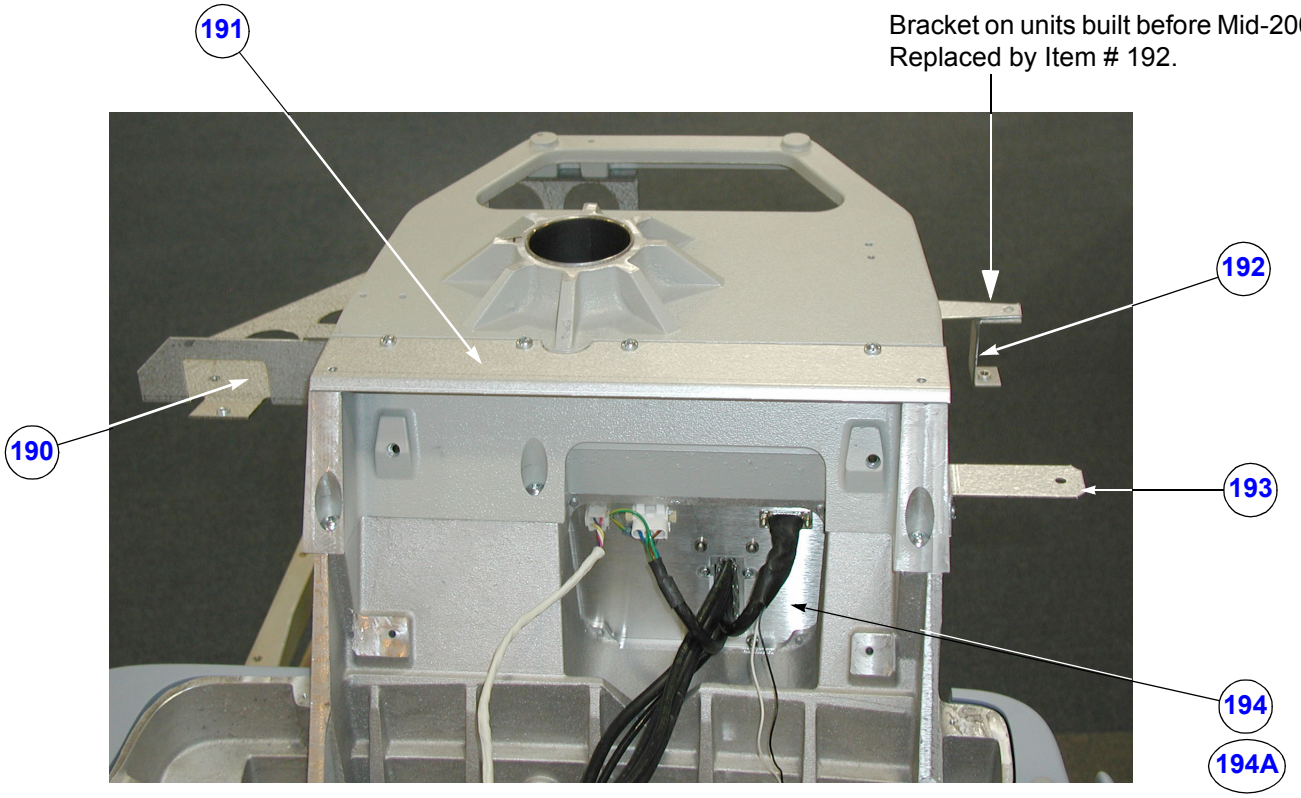


Figure 9-6 Operator Panel Brackets

Table 9-8 Operator Panel Brackets

ITEM	PART NAME	PART NUMBER	DESCRIPTION	QTY	FRU
190	Storage Tray Bracket	2306018		1	2
191	Upper Casting Bracket	2291449		1	2
192	“U” Bracket	2330476	‘U’ Shaped Bracket, Nut is Attached to Casting	1	2
193	TV/TR Front Bracket	2306021		1	2
194	Bulkhead Bracket	2305886	Does Not Include Cables Through BT03 with SVGA Style	1	2
194A	Bulkhead Bracket	5119174	BT04 with DVI Style	1	1

Section 9-8
Gas Spring

⚠ **WARNING** ***WHEN THE TOP CONSOLE IS IN ITS LOCKED POSITION, THE GAS SPRING IS COMPRESSED AND STORES MECHANICAL ENERGY. DURING NORMAL OPERATION THE TOP CONSOLE, THE WEIGHT OF THE MONITOR AND THE MECHANICAL FORCE OF THE GAS SPRING ARE IN BALANCE. TAKE CARE IF/WHEN YOU ACTIVATE THIS GAS SPRING. PERSONAL INJURY CAN OCCUR AFTER THE PANEL IS REMOVED AND THE SPRING PRESSURE IS RELEASED. TAKE CARE WHEN YOU REPAIR THE ELEVATION ASSEMBLY.***

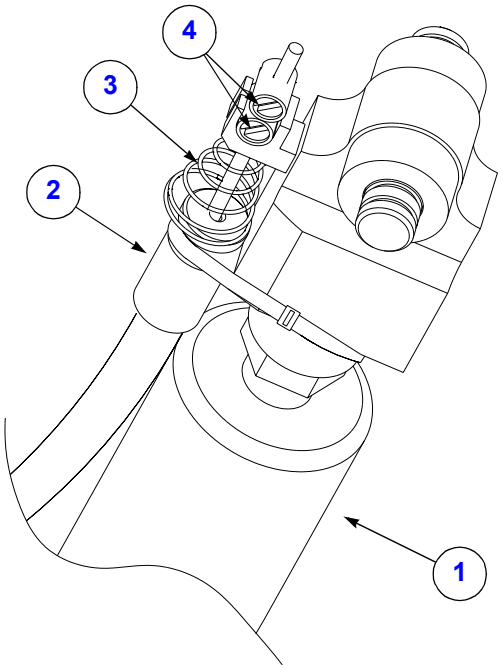


Figure 9-7 Gas Spring

Table 9-9 Gas Spring

Item	Part Name	Part Number	Description	Qty	FRU
1	Gas Spring	080X4500	- Same as Vivid 7-	1	1
2	Socket, Wire Cross Spring	FB307376	Socket for Gas Spring release cable	1	1
3	Spring	080X4010		1	1
4	Nipple Screws	080X4530		1	1

Section 9-9
Monitor Assembly

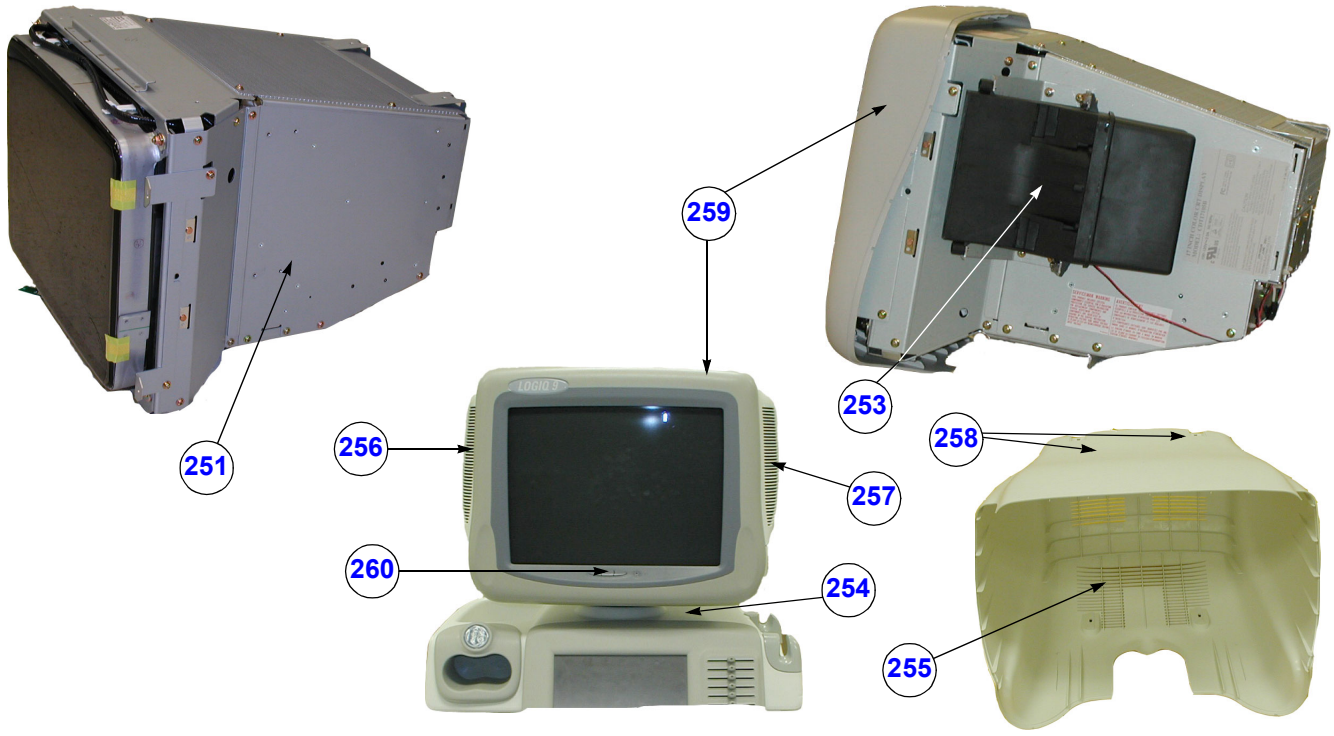


Figure 9-8 Monitor Assembly

Table 9-10 Monitor Assembly

Item	Part Name	Part Number	Description	Qty	FRU
251	Open Frame Monitor	2283334-4	*- Same as Vivid 7 & LOGIQ 7-*	1	1
252	Monitor Cable Assembly	2304171	*- Same as Vivid 7 & LOGIQ 7-* see Callout 545 on page 9-31	1	2
253	Speaker and Mounting Bracket Kit	2297882		2	2
254	Monitor Tilt/Swivel/Male Post	2284225	Neck Assembly	1	2
255	Monitor Rear Cover Assembly	2303930	Assembly with Speaker Grills	1	2
256	Monitor Left Speaker Grill	2279675	Labeled as the LEFT Speaker Grill	1	2
257	Monitor Right Speaker Grill	2279676	Labeled as the RIGHT Speaker Grill	1	2
258	Monitor Screw Caps (covers)	2303932	Covers the screws on each side in the back of the cover - *Same as Vivid 7 & LOGIQ 7-*	2	2
259	Monitor Front Bezel Assembly	2303929	Includes three logos Vivid 7, LOGIQ 7 and LOGIQ 9	1	2
260	Monitor Switch Assembly	2297050	User Switch Assembly	1	2

Section 9-10
Operator Control Panel Assembly

9-10-1 Upper Op Panel

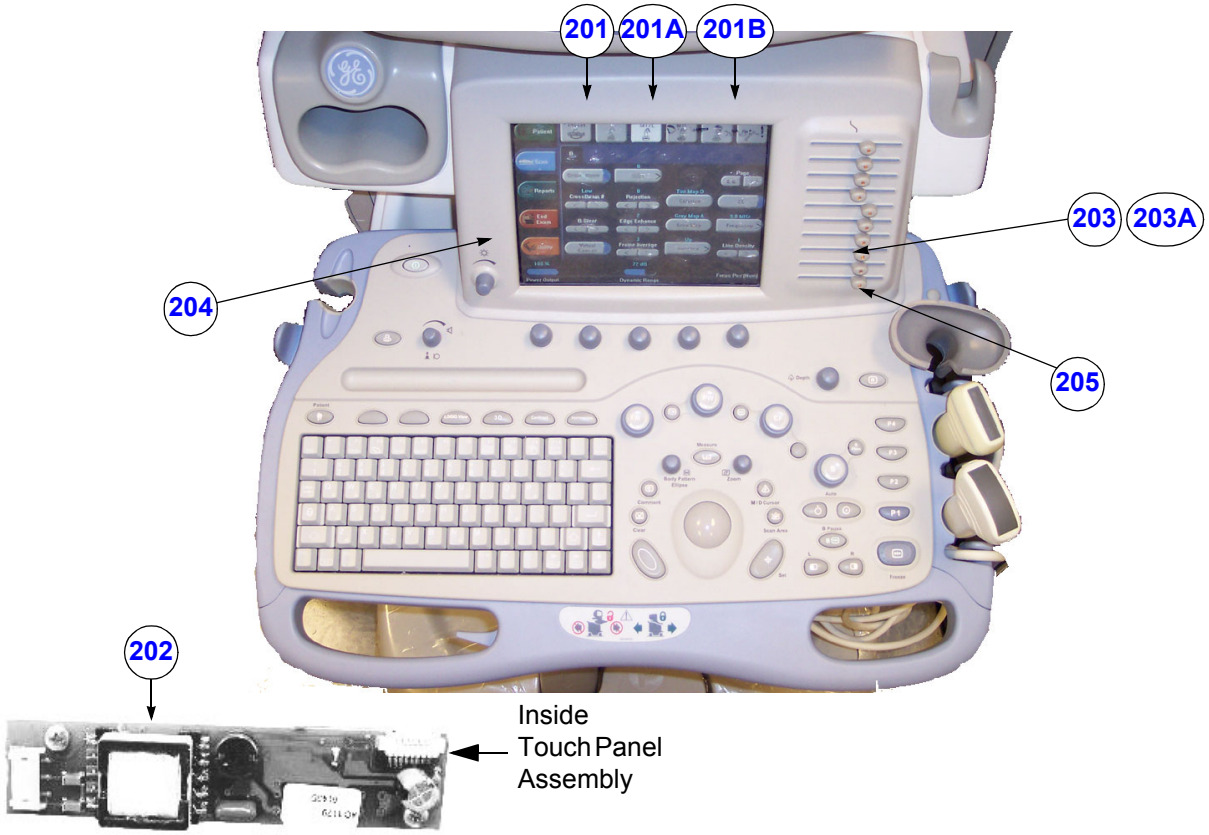


Figure 9-9 Operator Control Panel Assembly (Op I/O) - Upper

Table 9-11 Operator Control Panel Assembly - Upper

Item	Part Name	Part Number	Description	Qty	FRU
201	Upper Operator Panel Assembly	2188902-3	Obsolete - use 2188902-13	1	N
201A	Upper Operator Panel Assembly	2188902-13	has USB port A	1	1
201B	Upper Operator Panel Assembly	2404652-3	BT'04 Only with simplified cable interface Must be used with lower op panel 2404652-2	1	1
202	LCD Backlight Inverter	2188902-6	Use with 2188902-3 or -13	1	1
202A	LCD Backlight Inverter	2404652-6	Use with 2404652-3		
203	TGC (Slide Pot) PWA	2188902-7	Circuit board slide pot - For use with Upper Op Panel 2188902-3 or 2188902-13	1	1
203A	TGC (Slide Pot) PWA	2404652-7	Circuit board slide pot - For use with Upper Op Panel 2404652-3	1	1
204	Bezel - Upper Operator Panel	2188902-15		1	1
205	Slide Pot Knobs	5115063	group of ten knobs on TGC PWA	1	1

9-10-2 Lower Op Panel



Figure 9-10 Operator Control Panel Assembly (Op I/O) - Lower

Table 9-12 Operator Control Panel Assembly - Lower

Item	Part Name	Part Number	Description	Qty	FRU
211	Lower Operator Panel Assembly	2188902-2	- Obsolete - use 2188902-32	1	N
211A	Lower Operator Panel Assembly	2188902-12	With Standby. Backward compatible. R3.X.X Software and above MUST USE this part Obsolete - Will cross to 2188902-32 when stock is depleted	1	N
211B	Lower Operator Panel Assembly	2188902-32	BT03 lower op panel with 4D markings on buttons	1	1
211C	Lower Operator Panel Assembly	2404652-2	BT'04 with simplified cable interface Can only be used with upper op panel 2404652-3	1	1
212	A/N Keyboard - English	2188902-4	Alpha Numeric Keyboard R3.X.X Software and above MUST USE 2188902-14	1	1
212A	A/N Analog Keyboard - English	2188902-14	With Standby. Backward compatible. R3.X.X Software and above MUST USE this part	1	1
212B	A/N Analog Keyboard - English	2404652-4	improved back lighting	1	1
213	Russian A/N Keyboard	2188902-20	As required	1	1
213A	Russian A/N Keyboard	2404652-20	improved back lighting	1	1
214	Greek A/N Keyboard	2188902-21	As required	1	1
214A	Greek A/N Keyboard	2404652-21	improved back lighting	1	1
215	Trackball	2188902-5		1	1
216	4D Probe Holder	5111708		1	1
217	Bezel - Lower Operator Panel	2188902-11		1	1

9-10-3 Lower Op Panel - Buttons and Knobs

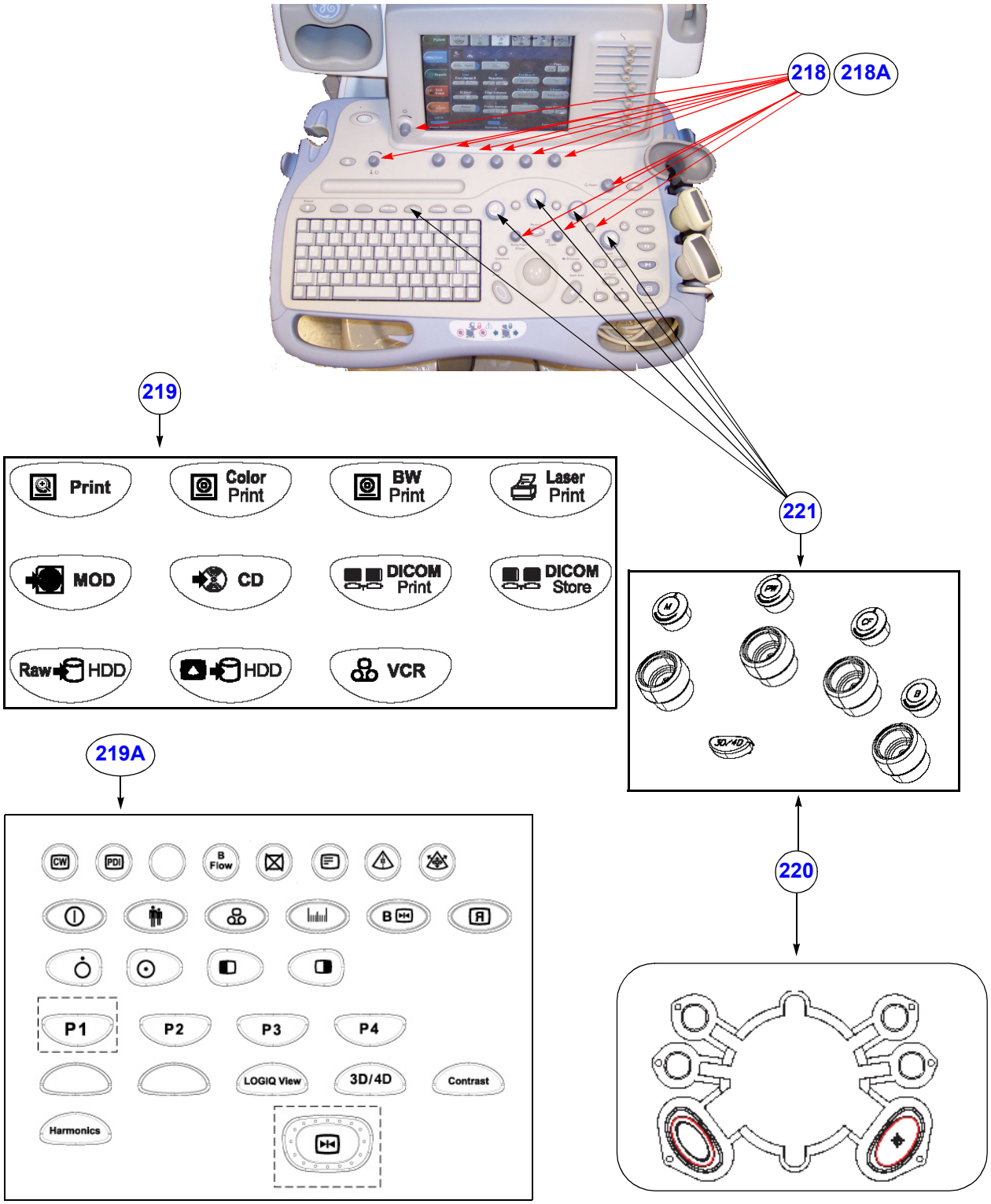


Figure 9-11 Operator Control Panel Assembly (Op I/O) - Lower

Table 9-13 Operator Control Panel Assembly - Lower - Buttons and Knobs

Item	Part Name	Part Number	Description	Qty	FRU
218	Universal Knob Kit	2384216	Obsolete - order 5114700	1	N
218A	Universal Knob Kit	5114700	All blue gumdrop knobs - Replaces 2384216 This Kit contained; 4 small domed knobs, 4 large dished knobs, 6 large domed knobs *same as Vivid 7*	1	1
219	Programmable Button Keytop Kit	2188902-9	Key caps for customer to customize the P1 - P4 key caps	1	1
219A	Button Cap Kit	2188902-10	Includes all buttons (except thumb buttons)	1	1
220	Key Ring and Operator Panel Mode select Knob Kit	2188902-8	Includes: 4 Mode select knobs (Inner & Outer pieces) and Key Ring (Kit is Used on Vivid 7, Vivid 7 PRO, Logiq 9)	1	N
221	Mode Select Knob Kit with 3D/4D Button with XYZ markings	2404652-8	Four Mode Select Knobs (M, PW, CF, B) and 3D/4D Grey Bowl Button	1	1

Section 9-11
Front End Processor Assembly

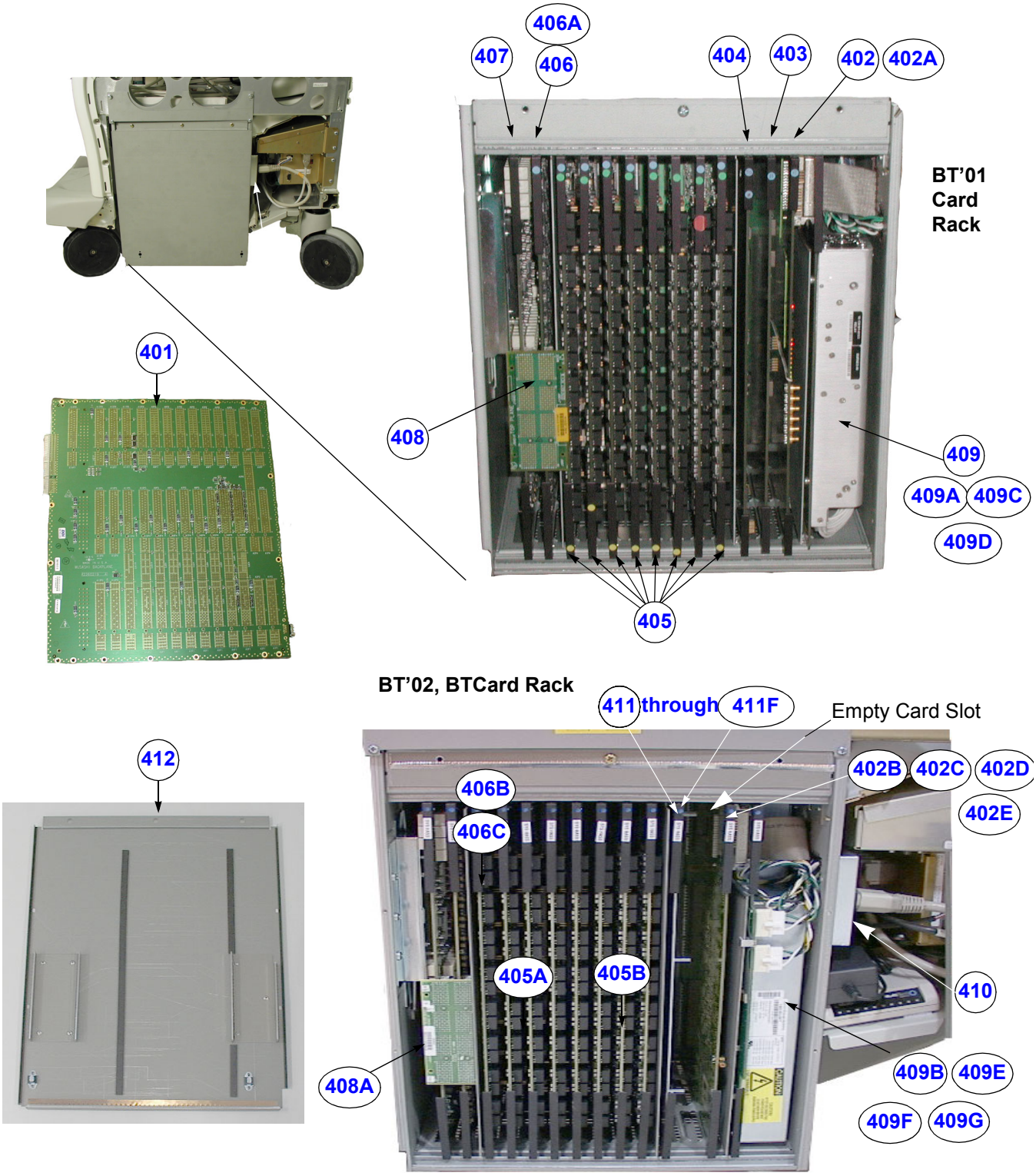


Figure 9-12 Front End Processor Assembly

Section 9-11 Front End Processor Assembly (cont'd)

Table 9-14 Front End Processor Assembly

Applications Software			R2.X.X		R3.X.X			R4.X.X						
LOGIQ 9 Model Number			2188900-X (BT'01)	2351100-X (BT'02)	2375600-X (BT'03)	2188900-X (BT01 - BT'03 upgrade)	2351100-X (BT02 - BT'03 upgrade)	2404587-X BT04	2188900-X (BT01 - BT04 upgrade)	2351100-X (BT02 - BT04 upgrade)	2375600-X (BT03 - BT04 upgrade)			
Item	Part Name	Part Number										Description	Qty	FRU
401	Back Plane	2260219	X	X	X	X	X	X	X	X	X	Front End Back Plane	1	2
402	SCB1	2260214-2	X									Scan Control Board Use 2260214-3 if stock is depleted	1	1
402A	SCB1.1	2260214-3	X[1]	X								Scan Control Board - Required if using EBM Board	1	1
402B	SCB2	2365739			X	X	X					Has BT'03 Functionality - Obsolete	1	N
402C	SCB2	2365739-3			X	X	X		X	X	X	Included power up transmit overload fix - Obsolete	1	N
402D	SCB2-4	2365739-4			X	X	X	X	X	X	X	Additional transmit overload fix during run time - Obsolete	1	N
402E	SCB2-5	2365739-5			X	X	X	X	X	X	X	Supervisory Circuit and 4D Reset Updates	1	1
411	EBM	2273639-3	X[2]	X								Combined functions of EQ4 & BMP4. Positioned in the old EQ4 Slot. Needs SCB 2260214-3 Obsolete - replace with 2273639-6	1	N
411A	EBM	2273639-6	X	X								I^2C Reliability Improvements	1	1
411B	EBM1.8	2273639-5			X	X	X					EBM Board Upgraded to EBM2 functionality - Replace with EBM2	1	N
411C	EBM2	2273639-20			X	X	X					Has BT'03 Functionality - obsolete - Replace with 2273639-21	1	N
411D	EBM2	2273639-21			X	X	X					Has BT'03 Functionality - I^2C Reliability Improvements	1	1
411E	EBM2.5	2273639-23							X	X	X	Has BT'04 Functionality 4D Option requires 2273639-24 Obsolete - replace with 2273639-24	1	N
411F	EBM2.6	2273639-24						X	X	X	X	Has BT'04 Functionality Required for 4D Option	1	1
403	BMP4	2260207	X									B-Mode Processor	1	1
404	EQ4	2260210	X									Equalization Board	1	1
405	TD4	2260194-2	X	X		X	X		X	X		Transmit/Delay Board	1	1
405A	TD5	2362863			X						X	New power requirements different from TD4. Can not mix with TD4s. Requires FEPS3 You can mix TD5s and TD5.1s When stock depleted order 2386031	1	1

Table 9-14 Front End Processor Assembly

Applications Software			R2.X.X		R3.X.X			R4.X.X						
LOGIQ 9 Model Number			2188900-X (BT'01)	2351100-X (BT'02)	2375600-X (BT'03)	2188900-X (BT01 - BT'03 upgrade)	2351100-X (BT02 - BT'03 upgrade)	2404587-X BT04	2188900-X (BT01 - BT04 upgrade)	2351100-X (BT02 - BT04 upgrade)	2375600-X (BT03 - BT04 upgrade)			
Item	Part Name	Part Number										Description	Qty	FRU
405B	TD5.1	2386031			X			X			X	Same Function as TD5 but larger and fewer ASICs. You can mix TD5s and TD5.1s	1	1
406	RF AMP	2260212	X			X			X			Radio Frequency Amplifier Board Obsolete - Use 2341985-2	1	N
406A	RF AMP1.2	2341985-2	X	X		X	X		X	X		Design Improvement	1	1
406B	RF AMP2	2357621			X			X			X	New power requirements different from RF AMP1.X - Requires FEPS3 with RF AMP2-2 use 2357621-2 if stock depleted	1	1
406C	RF AMP2-2	2357621-2			X			X			X	Same as RF Amp 2 except has schottky diodes Must use 2291656 Top Plane	1	1
407	XDIF	2260221	X	X	X	X	X	X	X	X	X	Transmit Differential Board	1	1
408	Top Plane	2291656	X	X	X	X	X	X	X	X	X	Top Plane connects XDIF to RF Amp on front of cards Not interchangeable with other Top Planes	1	1
408A	Top Plane	5115468			X			X			X	Has schottky diodes, Not interchangeable with other Top Planes	1	1
409	FEPS	2260203	X									Front End Power Supply - Obsolete - When replaced with 2273641-3 or 2273641-4, requires replacement of the Front End Card Rack Cover in Kit 2374426	1	N
409A	FEPS2	2273641-3	X[4]	X								Second Generation FEPS Cross to a FEPS2.1 if stock is depleted May require Front End Card Rack cover kit 2374426 if replacing a 2260203 FEPS	1	1
409B	FEPS2.1	2273641-4	X[4]	X		X	X					Second Generation with Standby Capabilities	1	1
409C	FEPS2.5	2273641-5	X[4]	X		X	X					partial latch fix (all but -5 V analog)	1	1
409D	FEPS2.6	2273641-6	X[4]	X		X	X		X	X	X	Replaces FEPS2 (2273641-3) and FEPS2.1 (2273641-4)	1	1
409E	FEPS3	2376843			X						X	Analog Voltages are +/- 6V and 13V compared to +/-6v and 12V found in FEPS, FEPS2 and FEPS2.1 Must be used in systems with TD5.X and RF Amp2 (DO NOT use in R2.X.X systems or Systems upgraded to BT'03)	1	N
409F	FEPS3.2	2376843-2			X						X	Partial latch fix (all but -6 V analog)	1	N
409G	FEPS3.3	2376843-3			X			X			X	Replaces 2376843 and 2376843-2	1	1

Table 9-14 Front End Processor Assembly

Applications Software			R2.X.X		R3.X.X			R4.X.X						
LOGIQ 9 Model Number			2188900-X (BT'01)	2351100-X (BT'02)	2375600-X (BT'03)	2188900-X (BT01 - BT'03 upgrade)	2351100-X (BT02 - BT'03 upgrade)	2404587-X BT04	2188900-X (BT01 - BT04 upgrade)	2351100-X (BT02 - BT04 upgrade)	2375600-X (BT03 - BT04 upgrade)			
Item	Part Name	Part Number										Description	Qty	FRU
410	FEP AC Line Filter & Cable	2315960	X	X	X	X	X	X	X	X	X	Attached to side of FEP Card Rack, Includes Line Filter and Power Harness	1	1
412	FEP Card Cage Front Cover Kit	2374426	X			X	X		X	X	X	Required if upgrading from FEPS to FEPS2/FEP2.1 Has additional shielding around Top Plane area and Power Supply areas. Labels included in kit to match FEP configuration	1	1

[1] SCB1 can be used on this model number also.

[2] EBM can be used on this model replacing the BMP4 and EQ4. However EBM requires SCB1.1 at a minimum.

[4] FEPS2 and FEPS2.1 can be used on this model number. However, must also use FEP Card Rack Cover Kit 2374426.

Section 9-12
I/O Interfaces

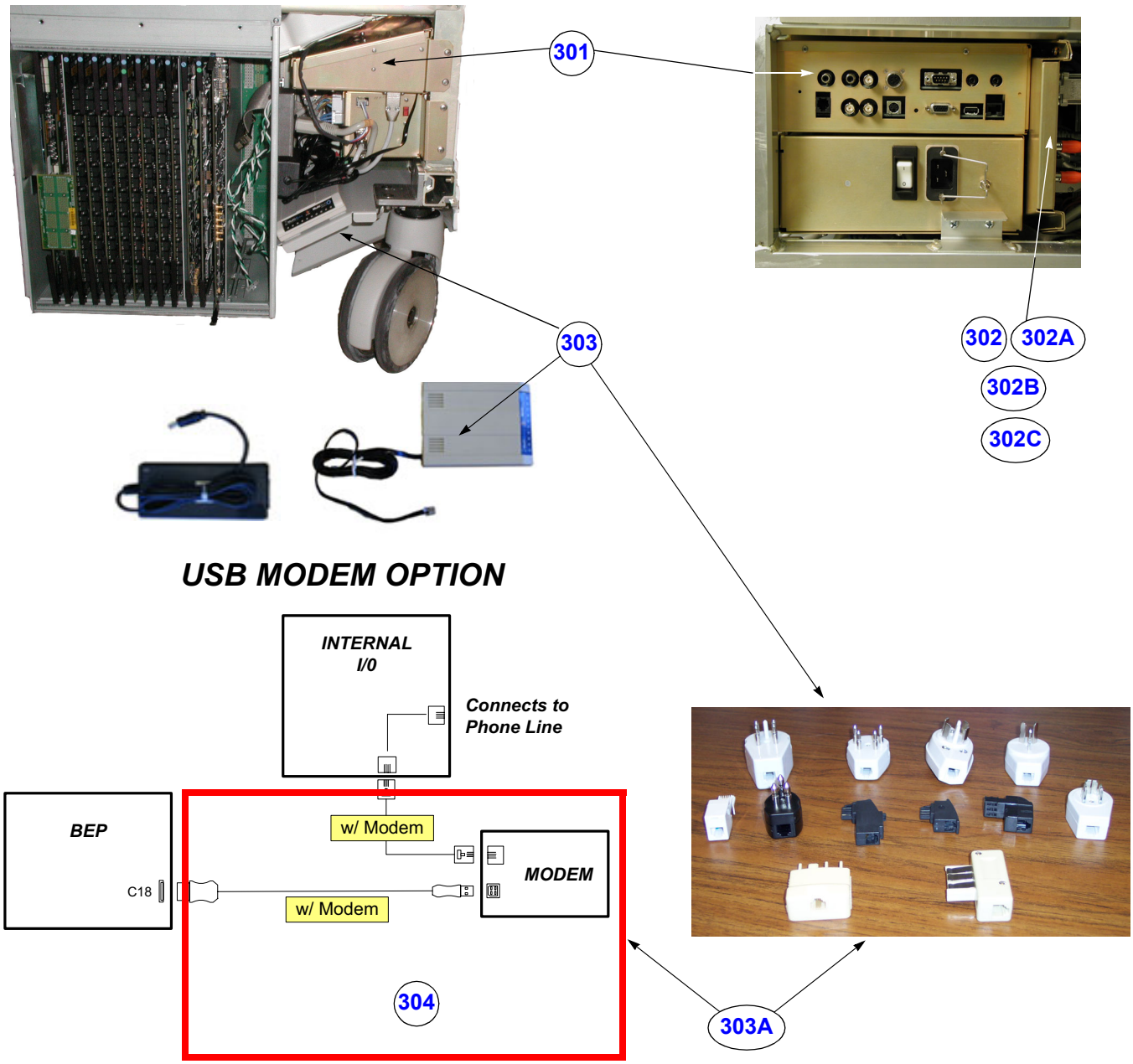


Figure 9-13 I/O Interfaces

Table 9-15 I/O Interfaces

Item	Part Name	Part Number	Description	Qty	FRU
301	External I/O Assembly	FB200198	*- Same as Vivid 7 -*	1	1
302	Internal I/O Assembly	FB200197	*- Same as Vivid 7 -* Obsolete - Use FC200423	1	N
302A	Internal I/O Assembly	FC200423	*- Same as Vivid 7 -* Has gain increase for improved microphone performance Used on BT03 and earlier use FC200446 when stock is out	1	1
302B	Internal IO Assembly	FC200446	*Compatible with Vivid 7 with RFI* *Can be used on LOGIQ 9 BT03 and earlier*	1	1
302C	Internal IO W/Gender change	FC200503	BT04 Only - Has male connector for II/O to BEP cable *- Same as Vivid 7 -*	1	1
303	Global Modem Assembly	2245794	Multi-Tech - New installation requires cable kit #2368850 *-Same as Vivid 7 -*	1	1
303A	USB Global Modem Kit	5112680	Includes modem 5114058, and Telco Adapter Kit 2249450 Used with BEP3 only	1	1
304	USB Modem	5114058	Includes USB Modem, USB Cable, and phone cables Used with BEP3 only	1	1

Section 9-13
3-D Externals

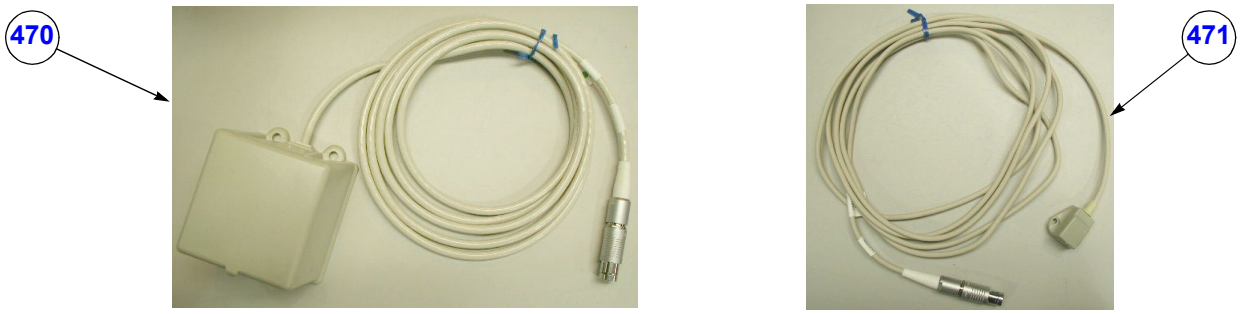


Figure 9-14 3-D Externals

Table 9-16 3-D Externals

Item	Part Name	Part Number	Description	Qty	FRU
470	3-D Externals - PCI Bird Transmitter	2301019-4	Option Kit	1	1
471	3-D Externals - PCI Bird Receiver	2301019-5	Option Kit	1	1

Section 9-14
Back End Processor Assemblies

9-14-1 BEP 1

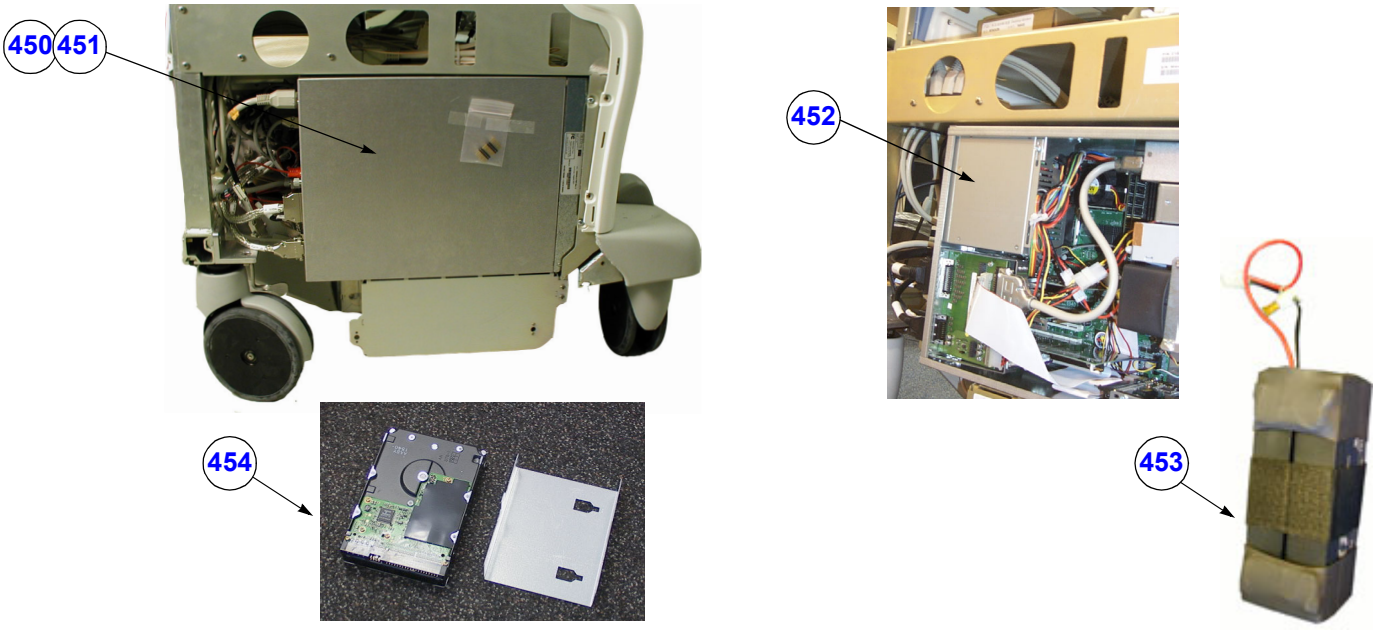


Figure 9-15 BEP 1

Table 9-17 Back End Processor Assembly 1

Item	Part Name	Part Number	Description	Qty	FRU
450	Back End Processor (BEP1)	2266548-3	BEP1 - P3 Processor	1	1
451	Back End Processor (BEP1) w/ 3-D Option	2266548-4	P3 Processor with 3-D “Flock of Birds” option (PCI Bird Transmitter & Receiver NOT Included - See Table 9-16)	1	1
452	Back End Processor Power Supply	2348186-38	Version 2.3 For BEPs 1 & 2.X	1	1
453	BEP Battery Assembly	2266548-5	Computer UPS Battery, located inside BEP Assy. Expected battery life is 1 year *-Same as Vivid 7 -*	1	2
454	Hard Disk Drive (HDD) BEP 1	2366650	Will need to transfer mounting tray to new HDD	1	1
455	BIOS Blaster CD	2266548-27	BEP1 only	1	1
456	Battery, CMOS	2404028-7	Motherboard battery	1	1

9-14-2 BEP 2

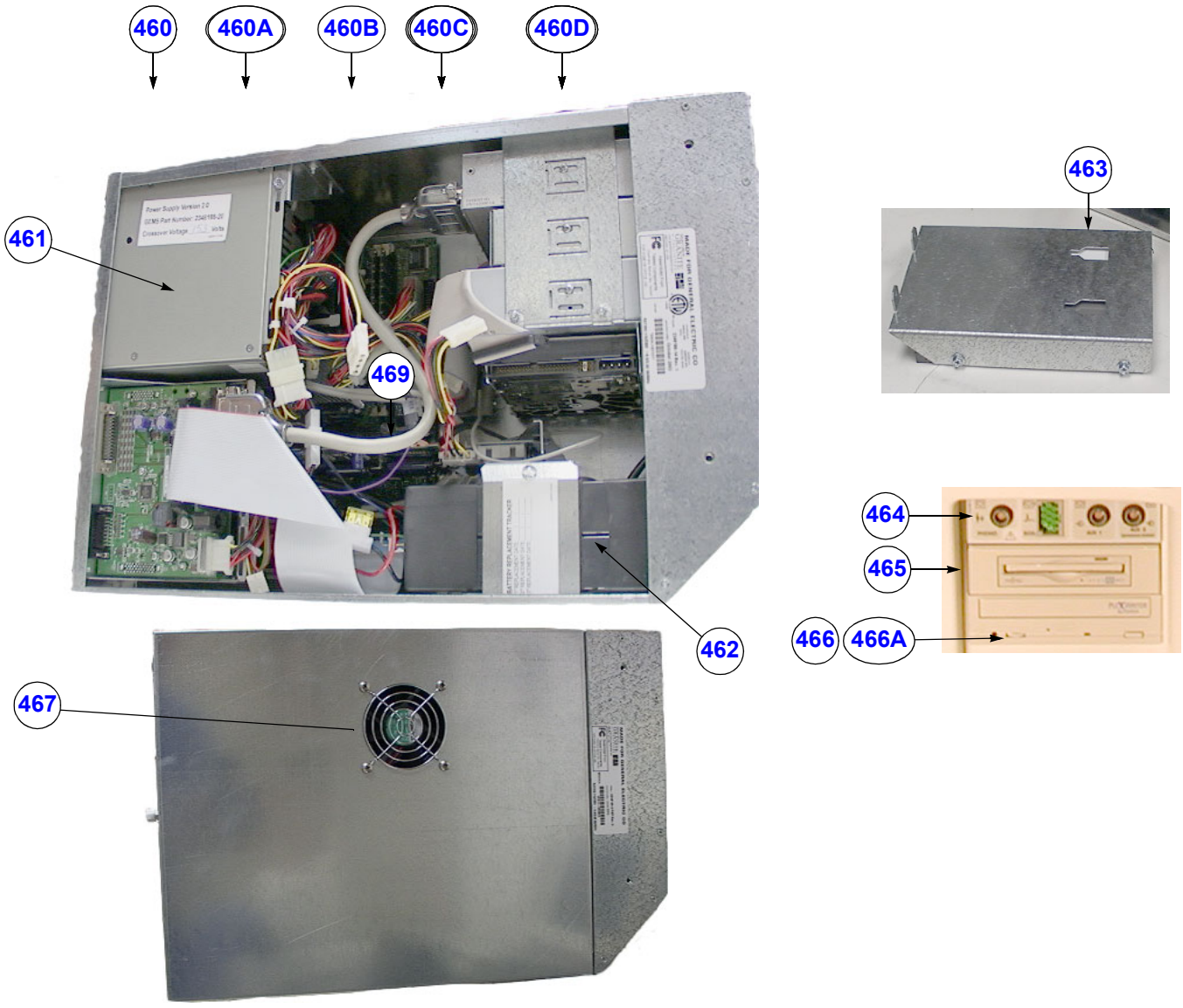


Figure 9-16 BEP 2

Table 9-18 Back End Processor Assembly 2

Item	Part Name	Part Number	Description	Qty	FRU
460	Back End Processor (BEP2.0)	2348186-3	P4 Processor	1	1
460	Back End Processor (BEP 2.0) w/ 3-D Option	2348186-4	P4 Processor with 3-D “Flock of Birds” option installed (PCI Bird Transmitter & Receiver NOT Included)	1	1
460	Back End Processor (BEP2.1)	2348186-43	BEP2.1 with 2.3 Power Supply	1	1
460	Back End Processor (BEP2.1)	2348186-44	BEP2.1 “Flock of Birds” with 2.3 Power Supply	1	1

Table 9-18 Back End Processor Assembly 2

Item	Part Name	Part Number	Description	Qty	FRU
460A	Back End Processor (BEP2.0.1)	2348186-67	BEP2..0.1w/SB0220 Audio Card	1	1
460A	Back End Processor (BEP2.0.1)	2348186-68	BEB2.0.1 w/SB0220 Audio Card with FOB	1	1
460A	Back End Processor (BEP2.0.1)	2348186-77	BEB2.0.1 w/SB0107 Audio Card	1	1
460A	Back End Processor (BEP2.0.1)	2348186-78	BEB2.0.1 w/SB0107 Audio Card w/ FOB	1	1
460B	Back End Processor (BEP2.1)	2348186-13	P4 Processor with Digital VIC Card	1	1
460C	Back End Processor (BEP 2.1) w/ 3-D Option	2348186-14	P4 Processor (Digital VIC Card) with 3-D “Flock of Birds” option installed (PCI Bird Transmitter & Receiver NOT Included)	1	1
460C	Back End Processor (BEP2.1)	2348186-53	BEP2.1 with New Sound Card	1	1
460C	Back End Processor (BEP2.1)	2348186-54	BEP2.1 “Flock of Birds” with New Sound Card	1	1
460C	Back End Processor (BEP2.1)	2348186-57	BEP2.1 w/o Base Image	1	1
460C	Back End Processor (BEP2.1)	2348186-58	BEP2.1 w/o Base Image w/ FOB	1	1
460D	Back End Processor (BEP2.2)	2348186-63	With Version 2.3 Power Supply Memory Upgrade to 768M	1	1
460D	Back End Processor (BEP 2.2) w/ 3-D Option	2348186-64	With Version 2.3 Power Supply Memory Upgrade to 768M	1	1
460D	Back End Processor (BEP2.2)	2348186-73	BEP2.2 Sound Card Change	1	1
460D	Back End Processor (BEP 2.2)	2348186-74	BEP2.2 “Flock of Birds” Sound Card Change	1	1
460D	Back End Processor (BEP2.2)	2348186-83	BEP2.2 PC2IP II Board	1	1
460D	Back End Processor (BEP 2.2)	2348186-84	BEP2.2 “Flock of Birds” PC2IP II Board	1	1
461	Back End Processor Power Supply	2348186-38	Version 2.3 For BEPs 1 & 2.X	1	1
462	BEP Battery Assembly	2266548-5	Computer UPS Battery, located inside BEP Assy. Expected battery life is 1 year *-Same as Vivid 7 -*	1	2
463	Hard Disk Drive (HDD) BEP 2.x	2348186-31	Comes with bracket or mounting tray	1	1
464	Patient I/O Module	2348186-22	*BEP 2.x Only -Same as Vivid 7 -*	1	1
465	MOD Drive	2348186-23	BEP 2.0 Only - 1.3 Gigabyte IDE - 3.5 inch	1	1
466	CD-RW Drive	2348186-37	*BEP 2.x Only -Same as Vivid 7 -* Obsolete - Use 2348186-47	1	N
466A	CD-RW Drive	2348186-47	BEP 2.x	1	1
467	Fan	2348186-25	Mounted on BEP Chassis Cover - BEP 2.x Only *-Same as Vivid 7 -*	1	1
468	BIOS Blaster CD	2348186-27	BEP2.x only	1	2
469	Battery, CMOS	2404028-7	Motherboard battery	1	1

9-14-3 BEP 3

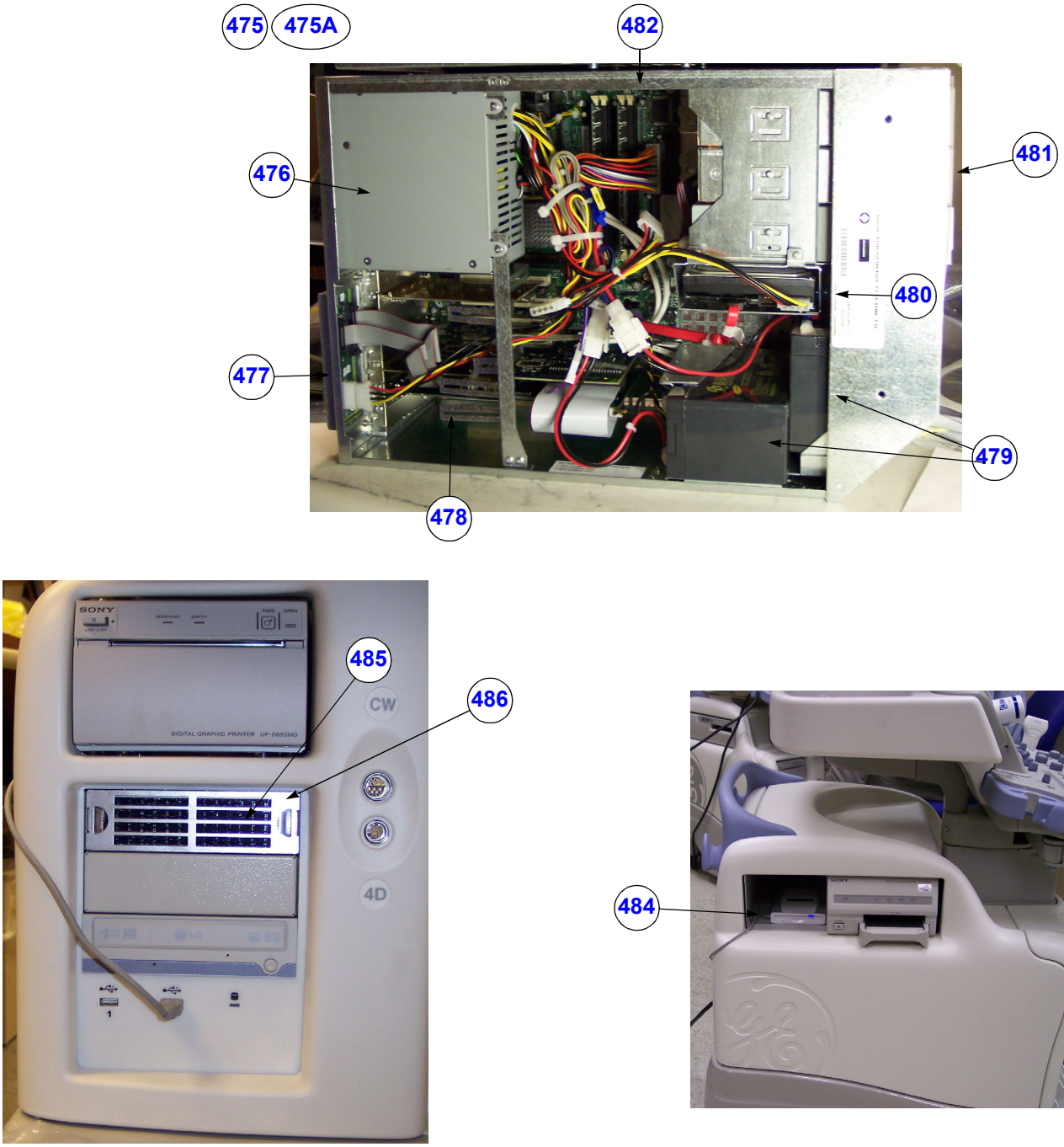


Figure 9-17 BEP 3

Table 9-19 Back End Processor Assembly 3

Item	Part Name	Part Number	Description	Qty	FRU
475	Back End Processor (BEP3.0) Non-"Flock of Birds"	2404027-3	Complete assembly	1	1
475A	Back End Processor (BEP3.0) with "Flock of Birds"	2404027-4	Complete assembly	1	1
476	BEP 3 Power Supply	2404028-4		1	1
477	PCI DGVIC Assembly	5112272	with bulkhead board and ribbon cables	1	1
478	PC2IPII card	FC200312		1	1
479	Battery, BEP3 UPS	2404028-6	Set of 2 batteries Expected battery life is 1 year	1	1
480	Hard Disk Drive (HDD) BEP 3	2404028-2	Comes with bracket or mounting tray	1	1
481	DVD Drive	2404028	BEP 3 Comes with bracket or mounting tray	1	1
482	Battery, BEP3 CMOS	2404028-7	Motherboard battery	1	1
483	BEP3 Fan, Side Cover	2348186-35	Mounted on BEP Chassis Cover - BEP 3 only *-Same as Vivid 7 -*	1	1
484	MO Drive (External - stand alone)	2404028-3	For use with BEP 3 - BEP 3 does not contain a MO Drive	1	1
485	Filter	2404028-8		1	1
486	Cover, FIlter	2404028-9		1	1
487	BIOS Blaster CD	5111457	For BEP 3 motherboard reset	1	1

Section 9-15
Software

Table 9-20 BEP Base Image Load Matrix

Application Software	L9 BEP HARDWARE CONFIGURATION								
	BEP1 2266548 2266548-2 2266548-3 2266548-4 2266548-6 2266548-10 2266548-12 2266548-13 2266548-14 2266548-16	BEP2.0 2348186-3 2348186-4 2348186-43 2348186-44	BEP2.0.1 (Prior to BT03) 2348186-67 2348186-68 2348186-77 2348186-78	BEP2.0.1 (For BT03) 2348186-67 2348186-68 2348186-77 2348186-78	BEP2.1 2348186-13 2348186-14 2348186-53 2348186-54 2348186-57 2348186-58	BEP2.2 (Prior to BT03) 2348186-63 2348186-64 2348186-73 2348186-74 2348186-83 2348186-84	BEP2.2 (For BT03) 2348186-63 2348186-64 2348186-73 2348186-74 2348186-83 2348186-84	BEP2.2 (For BT04) 2348186-63 2348186-64 2348186-73 2348186-74 2348186-83 2348186-84	**BEP3 2404027-3 2404027-4**
R2.4.0 (1)	2358135-11	2371612-13	2371612-13	NA	2371612-13	2371612-13	NA	NA	NA
R3.0.2	NA	NA	NA	2371612-2	NA	NA	2371612-2	NA	NA
R3.0.5	NA	NA	NA	2371612-3	NA	NA	2371612-3	NA	NA
R3.0.6	NA	NA	NA	2371612-3	NA	NA	2371612-3	NA	NA
R3.0.8	NA	NA	NA	2371612-3	NA	NA	2371612-3	NA	NA
R3.0.9	NA	NA	NA	2371612-3	NA	NA	2371612-3	NA	NA
R3.0.10	NA	NA	NA	2371612-13	NA	NA	2371612-13	NA	NA
R3.0.11 (3)	NA	NA	NA	2371612-13	NA	NA	2371612-13	NA	NA
R4.0.4	NA	NA	NA	NA	NA	NA	NA	2404024	2404024-2
R4.1.0 (4)	NA	NA	NA	NA	NA	NA	NA	2404024-3	2404024-4
Current (2) Base Image Load	2358135-11	2371612-13	2371612-13	2371612-13	2371612-13	2371612-13	2371612-13	2404024-3	2404024-4

NOTE: (1) All previous R2.X revs obsolete due to FMI 70185
(2) Base Image Loads for Respective BEP are Backwards compatible.
(3) Current R3.X Application Software = R3.0.11 (2322686-37).
(4) Current R4.X Application Software = R4.1 .0 (2322686-39)

Section 9-16
Interconnect Cables

9-16-1 Peripheral Cables

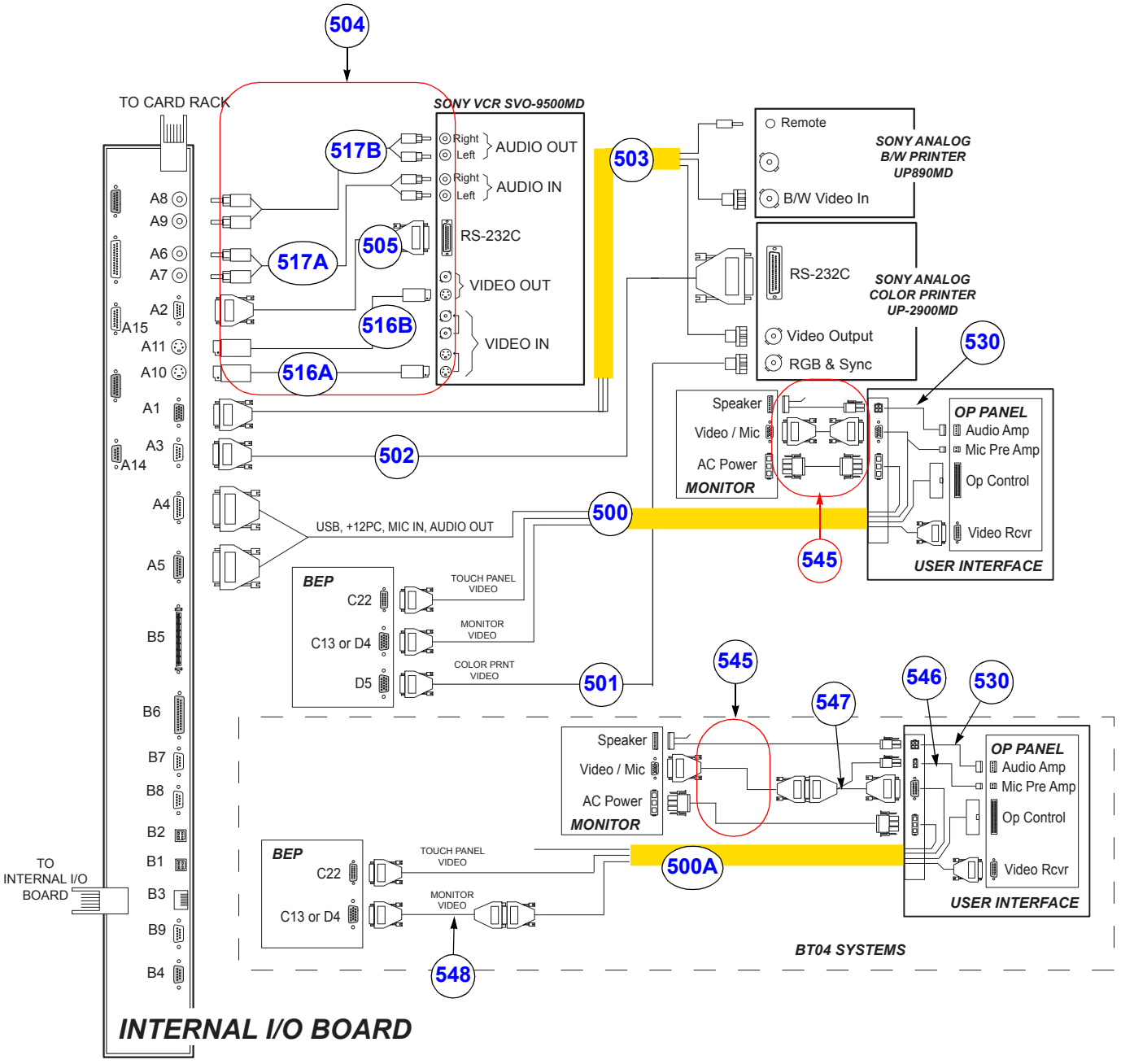


Figure 9-18 Peripheral Cable Diagram

Table 9-21 Peripheral Cables

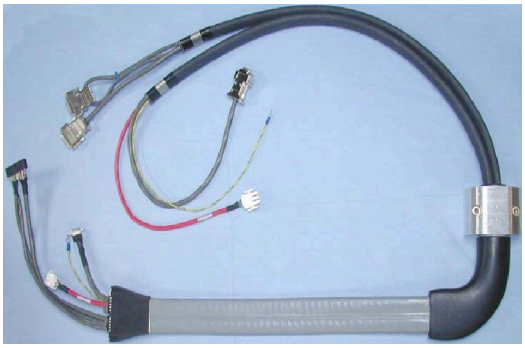
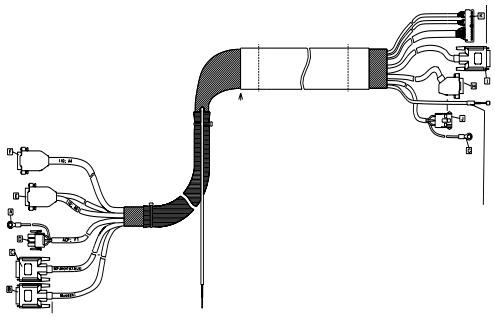
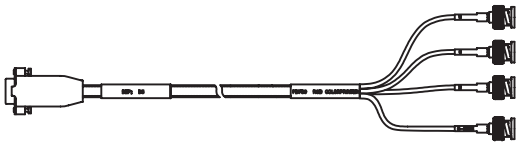
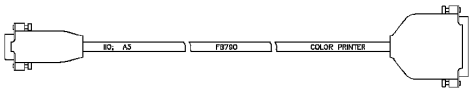
Item	Part Name	Part Number	Description	Qty	FRU
500	Console Cable Assembly (complete)	FB200320	Top Console and Monitor to IIO, AC Ctrl, BEP and Gas spring - *Same as Vivid 7 -* 	1	1
500A	Cable, Main harness w DVI	5119218	 BT04	1	1
501	Color Printer Video Cable	FB200789	RGB & Sync From PCVIC to Color Printer - #1 -BEP-D5 to RGB Color Printer - *Same as Vivid 7 -* 	1	1
502	Color Printer Control Cable	FB200790	*#2 - Same as Vivid 7 -* 	1	1
503	BW/CP Printer Cable	FB200791	#3 - IIO-A1 to BW/Color Printer - *Same as Vivid 7 -* 	1	1

Table 9-21 Peripheral Cables

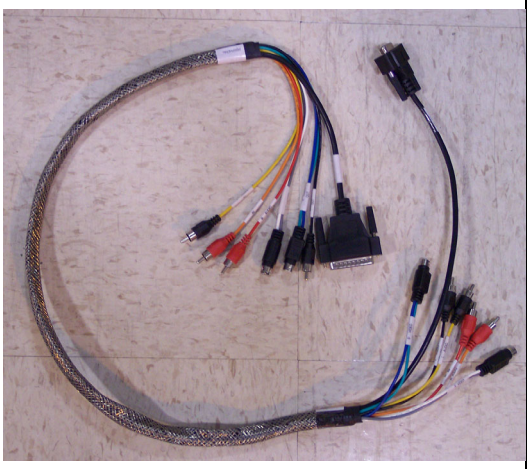
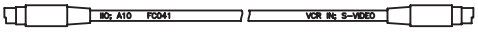
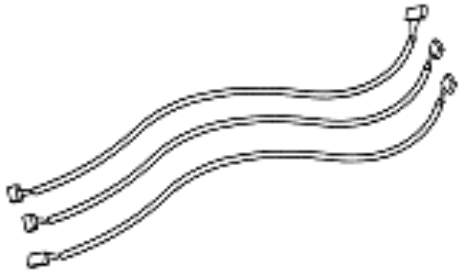
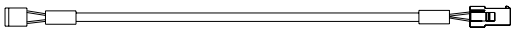
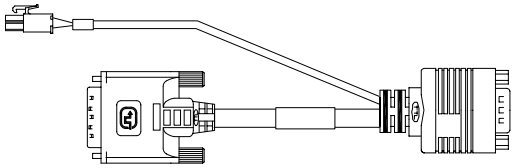
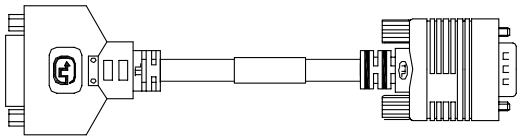
Item	Part Name	Part Number	Description	Qty	FRU
504	VCR Cable Harness	2371911	 Combines FB200792 & FC200041 & FC200042 & FC200043 & FC200044 Same as Vivid 7	1	1
505	VCR Remote Control Cable	FB200792	#4 - IIO-A2 to VCR - *Same as Vivid 7* - 	1	1
516A	SVHS Cable, Shielded	FC200041	#16 - IIO-A10 to VCR IN - *Same as Vivid 7* - 	2	1
516B	SVHS Cable, Shielded	FC200042	#16 - IIO-A10 to VCR Out- *Same as Vivid 7* - 	2	1
517A	Audio Cable, Shielded	FC200043	#17 - IIO-A6/A7 to VCR IN CH1(L)/CH2(R) *- Same as Vivid 7 -* 	2	1
517B	Audio Cable, Shielded	FC200044	#17 - IIO-A6/A7 to VCR OutCH1(L)/CH2(R) *- Same as Vivid 7 -* 	2	1
530	Speaker Cable - Bulkhead	2319024		1	1

Table 9-21 Peripheral Cables

Item	Part Name	Part Number	Description	Qty	FRU
545	Monitor Cable Assembly	2304171	*- Same as Vivid 7 & LOGIQ 7-* 	1	2
546	cable, internal microphone	5119245		1	1
547	adapter, DVI to SVGA w mic	5118498	 Found Behind OPIO	1	1
548	adapter, SVGA to DVI	5119495	 Found on Back of BEP	1	1

9-16-2 Peripheral Cable - Analog Color Printer with BEP3

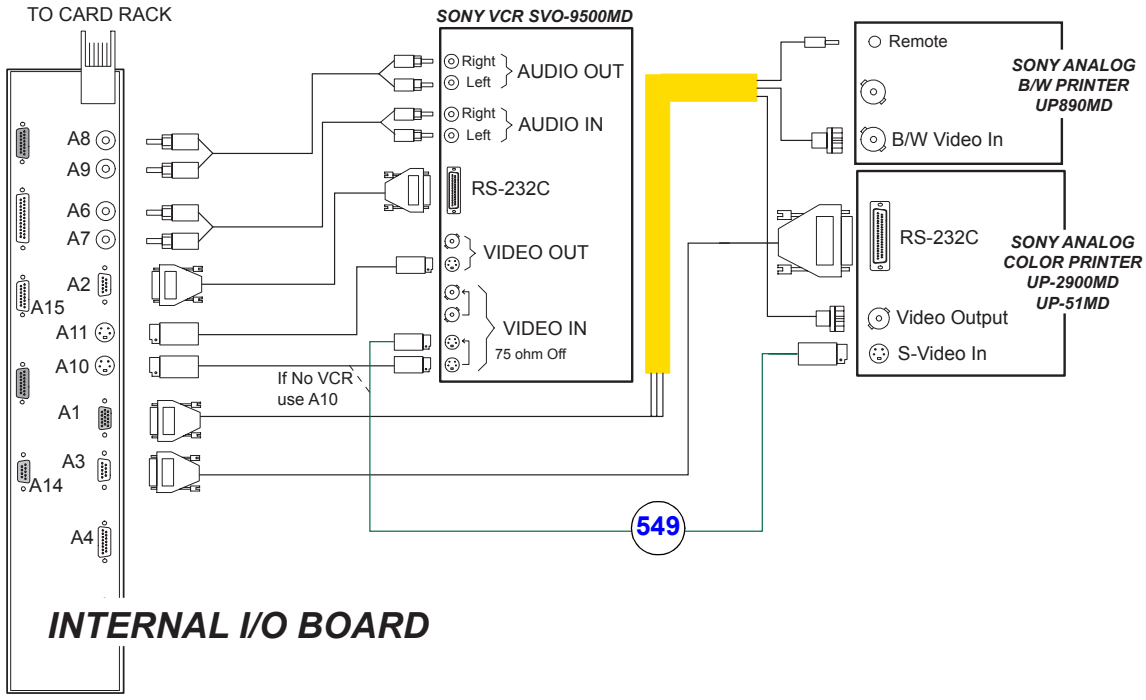
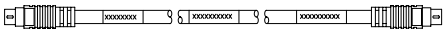


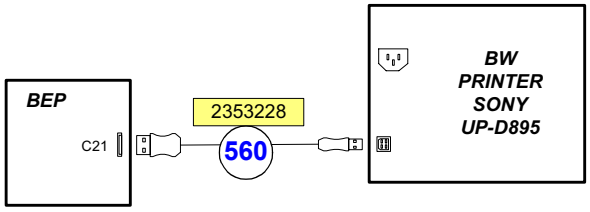
Figure 9-19 Analog Color Printer W/BEP3

Table 9-22 Analog Color Printer W/BEP3

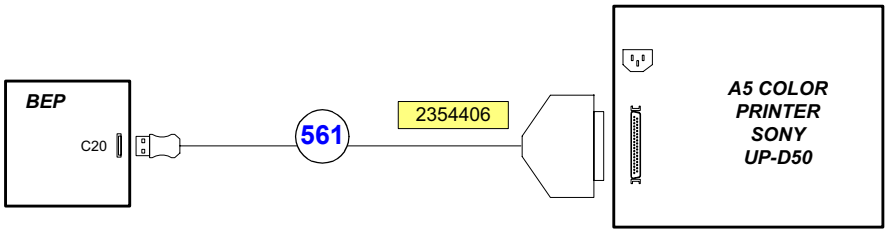
Item	Part Name	Part Number	Description	Qty	FRU
549	Cable, S-Video	5113288		1	1

9-16-3 Peripheral Cable - USB Printer Cables

BW PRINTER UP-D895



COLOR PRINTER UP-D50



COLOR PRINTER UP-D21, 23, 55

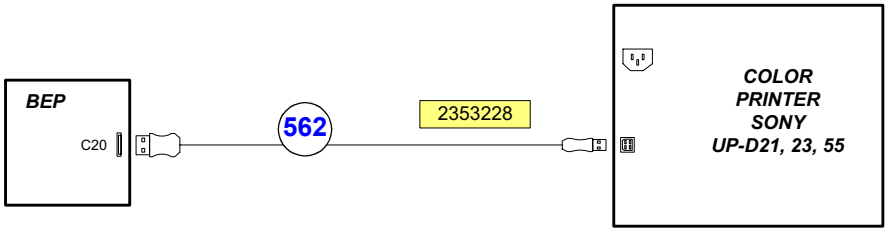


Figure 9-20 USB Printer Cables

Table 9-23 USB Printer Cables

Item	Part Name	Part Number	Description	Qty	FRU
560	CABLE, USB 2.0 COMPLIANT 1.0M	2353228	BEP C21 to BW Printer Sony UP-D895	1	1
561	USB TO SCSI ADAPTER	2354406	From C20 to SCSI for Sony UP-D50 input	1	1
562	CABLE, USB 2.0 COMPLIANT 1.0M	2353228	BEP C20 to Color Printer Sony UP-D21, UP-D23, UP-D55	1	1

9-16-4 AC Distribution Cables

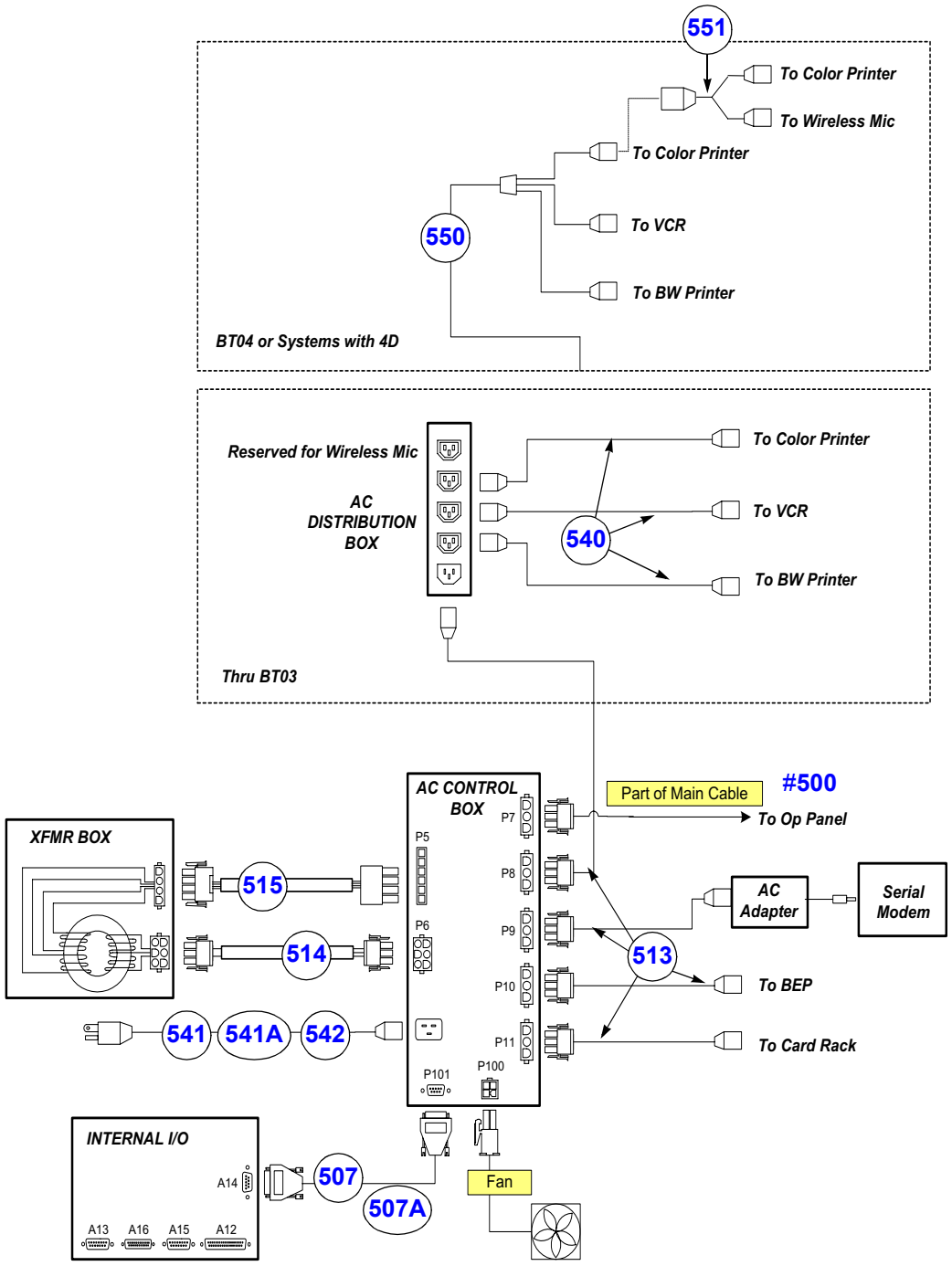


Figure 9-21 AC Distribution Cable Diagram

Table 9-24 AC Distribution Cables

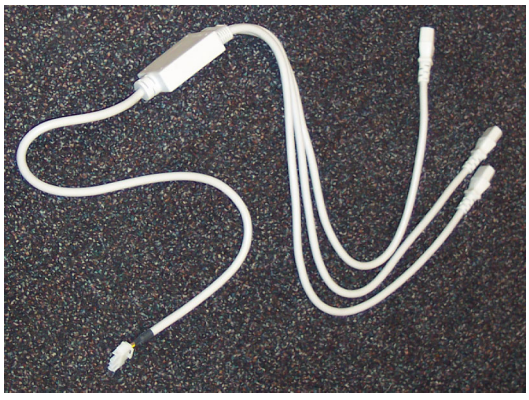
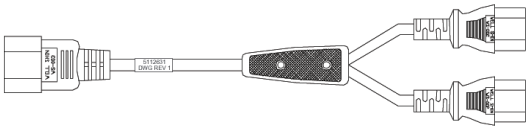
Item	Part Name	Part Number	Description	Qty	FRU
507	Fan Speed Control Cable	FB200795	#7 - IIO-A15 to ACP-F8 	1	1
507A	Fan Speed Control Cable if EQ4 PWA (2260210) is Rev K or earlier	2333827	#7 - IIO-A15 to ACP-F8 	1	1
513	AC-Distribution Cable Kit	FB200802	Includes FB200802-1, FB200802-2, FB200802-3 & FB200802-4	1	1
514	AC Mains 1 Cable	FB200803	#14 - ACT-M1 to ACP-F6 - *Same as Vivid 7* - 	1	1
515	AC Mains 2 Cable	FB200804	#15 - ACT-M2 to ACP-F7 - *Same as Vivid 7* - 	1	1
540	AC Peripheral Cable	070C5080	AC to Color & B/W Printers and VCR	3	1
541	AC Power Cord - USA	2162856	Obsolete - replaced by 2286301	1	N
541A	AC Power Cord - USA	2286301		1	1
542	AC Power Cord - Outside USA	2118615	Obsolete 	1	N
542A	AC Power Cord - Outside USA	070C3194		1	1
550	Cable, 3 Head AC Power	FC200571		1	1

Table 9-24 AC Distribution Cables

Item	Part Name	Part Number	Description	Qty	FRU
551	Cable, AC Power Split Y	5112631	 Required If Using 3 Head AC Power Cable and Voice Command	1	1

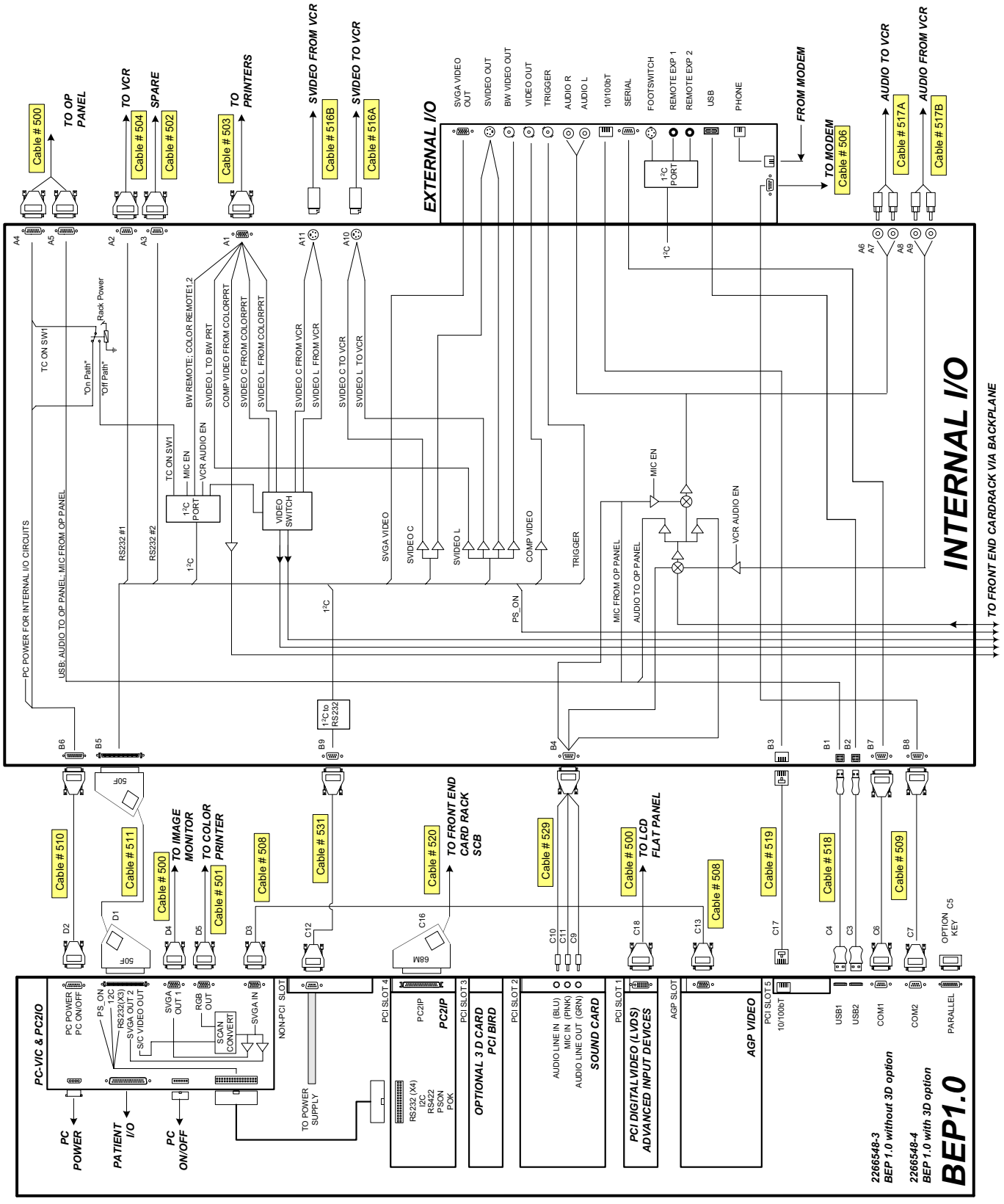


Figure 9-22 BEP 1.0 and II/O Cabling Diagram

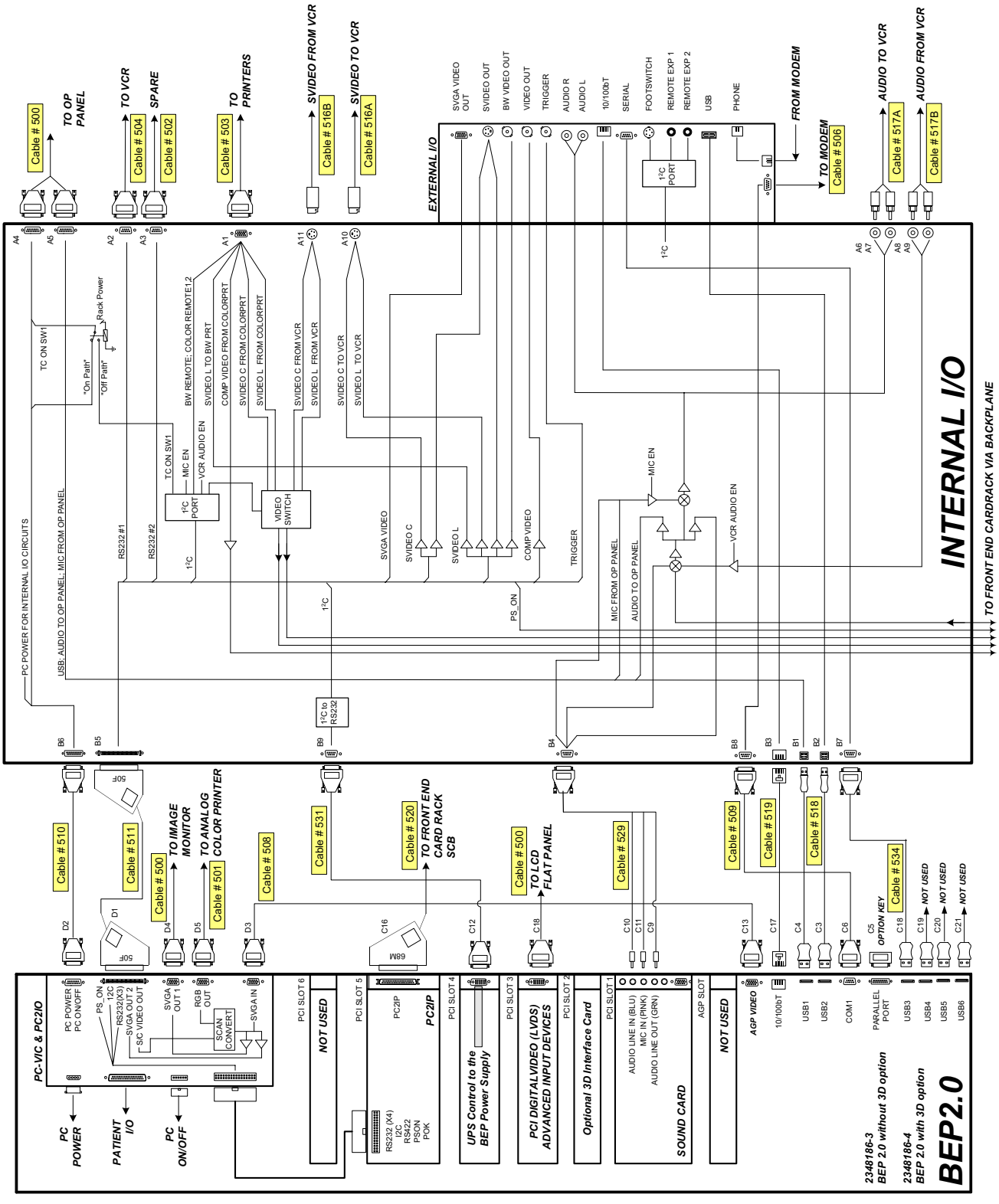


Figure 9-23 BEP 2.0 and II/O Cabling Diagram

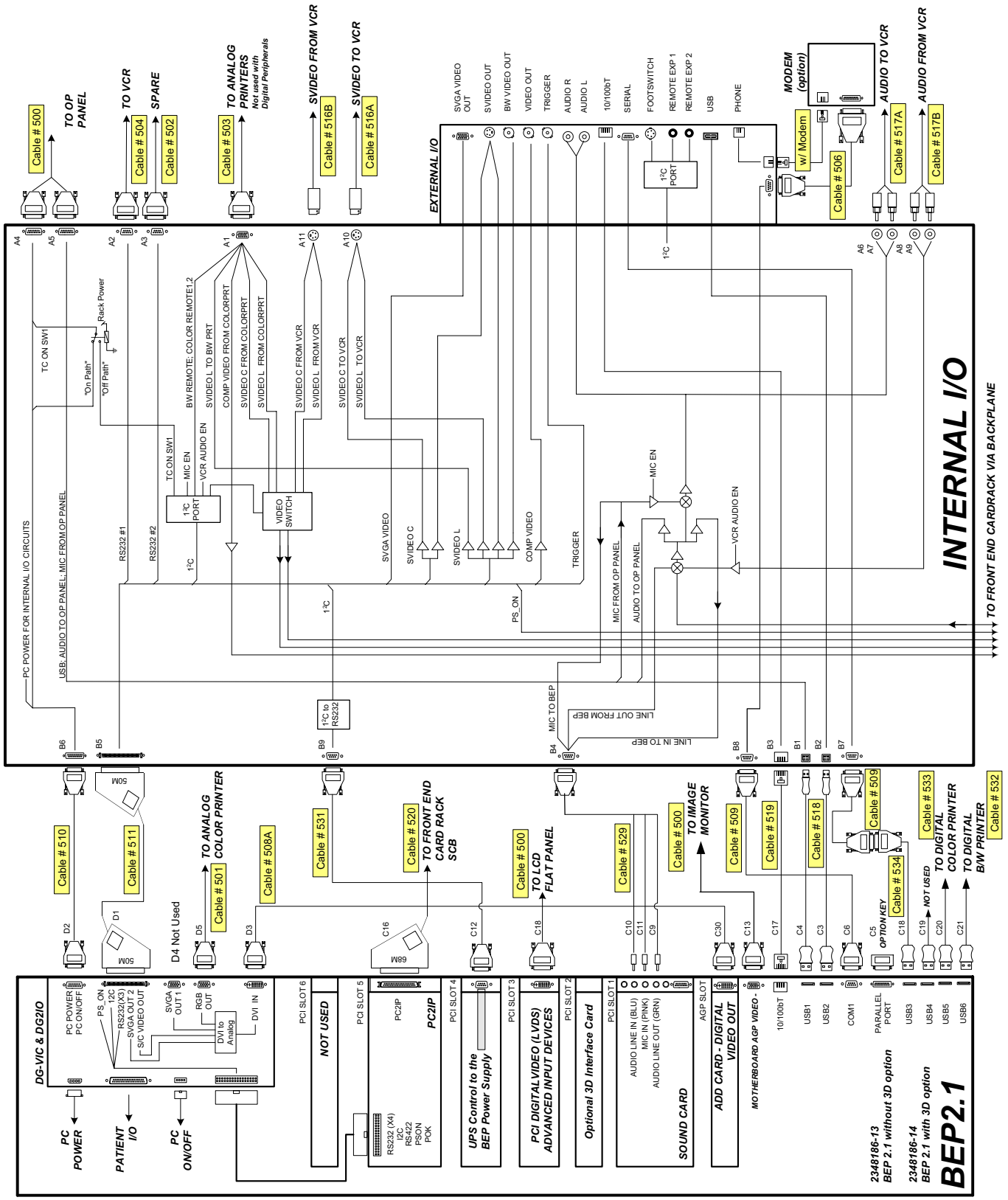


Figure 9-24 BEP 2.1/2.2 and II/O Cabling Diagram

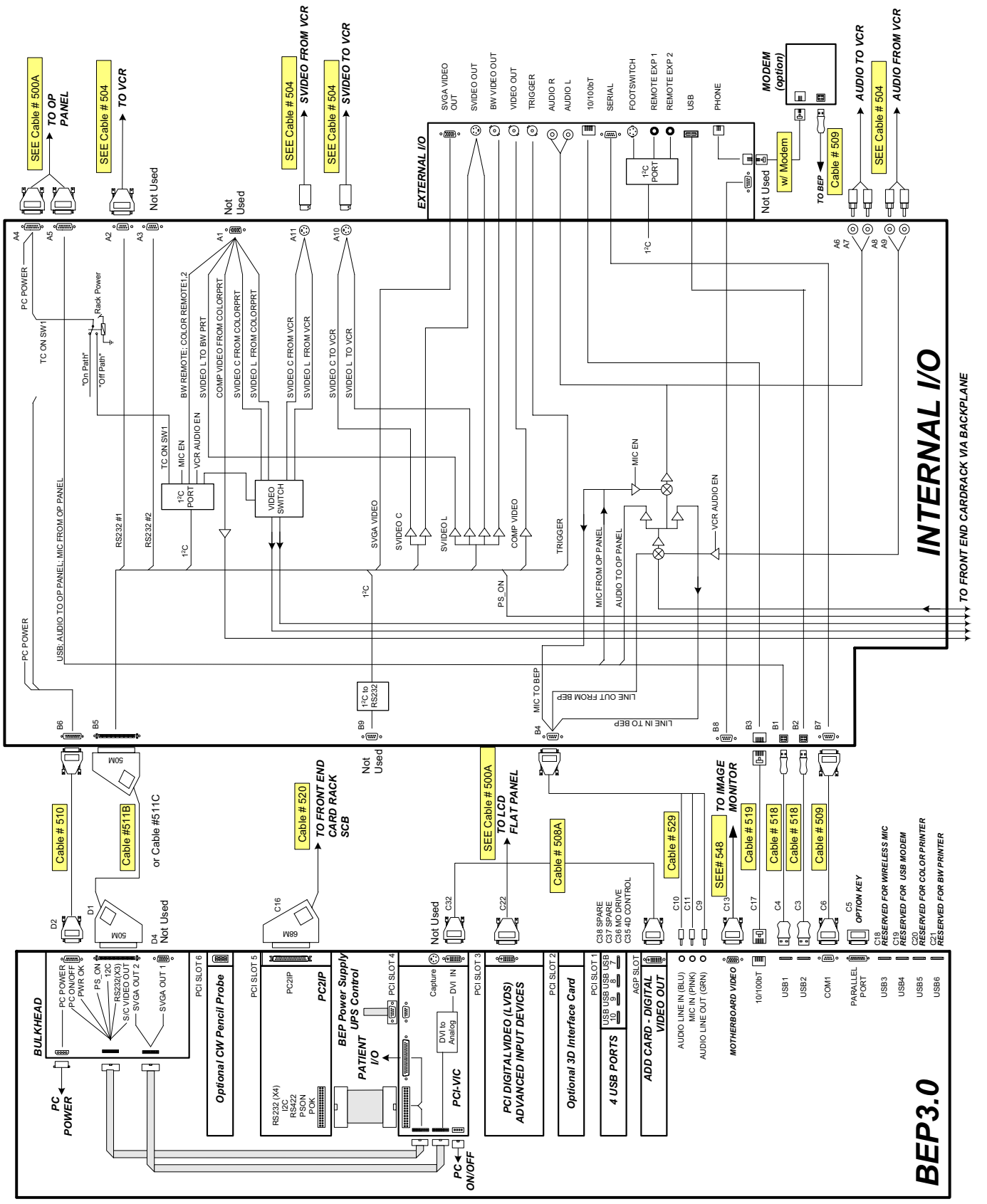


Figure 9-25 BEP 3 and II/O Cabling Diagram

Table 9-25 Internal I/O Cables

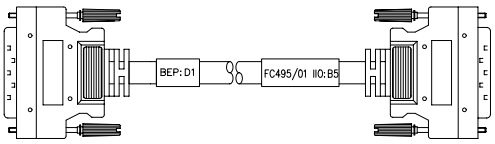
Item	Part Name	Part Number	Description	Qty	FRU
505	Doppler Cable	FB200793	From Front Panel to Front End Processor - #5 Not used on BT04 	1	1
506	Standard Modem Cable	FB200794	From Modem to External I/O - #6 Packaged with FB200802-1 (modem power cable) and used with Serial Modem Option kit 	1	1
508	Monitor Cable Standard	FB200796	BEP AGP Video to PCVIC Card SVGA - #8 - BEP-C13 to BEP-D3 - *Same as Vivid 7* - 	1	1
508A	Digital Video Interface Cable	2354056	Interface from AGP Slot ADD card to DGVIC BEP 2.1 & BEP3	1	1
509	RS232 Com 1/2 Cable	FB200797	#9 - IIO-B7 to BEP-C6 or IIO-B8 to BEP-C7 Used with 2364642 in BEP 2.x Systems *- Same as Vivid 7 -* 	2	1
510	Internal I/O-PC2IO Power/Control Cable	FB200798	#10 - IIO-B6 to BEP-D2 - *Same as Vivid 7* - 	1	1
511	Internal I/O-PC2IO Signals Cable	FB200799	#11 - Obsolete Use FC200286-	1	N
511A	Internal I/O-PC2IO Signals Cable	FC200286	 #11A BEP D1 to IIO B5 *Same as Vivid 7* - Improved flex and length	1	1
511B	Cable, Signals, IIO-BEP Male to Male	FC200495	 D1 to IIO B5 Needed if using BEP3 w/ Internal I/O FC200503		

Table 9-25 Internal I/O Cables

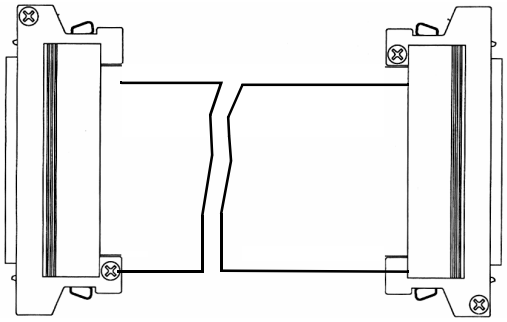
Item	Part Name	Part Number	Description	Qty	FRU
511C	Cable, Signals, IIO-BEP Male to Female	2404419	 Needed if using BEP3 w/internal I/O FC200423 or FC200446		
518	USB A-B Cable	070D2802	#18 - *Same as Vivid 7* - 	2	1
519	Ethernet Cat-5 Cable	070D2902	#19 - *Same as Vivid 7* - 	1	1
520	PCI Cable, AMP 974298	070M0016	PCI Bus Extension Cable BEP to FEP - #20 *- Same as Vivid 7 -* 	1	1
529	Internal I/O-PC Audio Cable	FB200748	#29 - IIO-B4 to BEP-AUD - *Same as Vivid 7* - 	1	1
531	UPS Control Cable	FC200016		1	1
532	Digital B/W Printer Cable	2363062	From USB #6 to Digital B/W Printer - BEP 2.1 Straight USB, gray in color	1	1
533	Digital Color Printer Cable		From USB #5 to Digital Color Printer (USB to SCSI) BEP 2.1, Right angle USB, black in color	1	1

Table 9-25 Internal I/O Cables

Item	Part Name	Part Number	Description	Qty	FRU
534	USB to Serial Adapter Cable	2348186-26	From USB #3 To Serial Cable To Internal I/O B7 - Obsolete Use 2364642 and FB200797 	1	N
534A	USB to Serial Adapter Cable	2364642	From USB #3 To Serial Cable FB200797 To Internal I/O B7 (Ext I/O Com Port) BEP 2.0 & 2.1 & BEP3 	1	1
535	USB to SCSI Adapter	2354406	From USB to SCSI for Sony UP-D50 input	1	1

Section 9-17
Power Distribution Modules

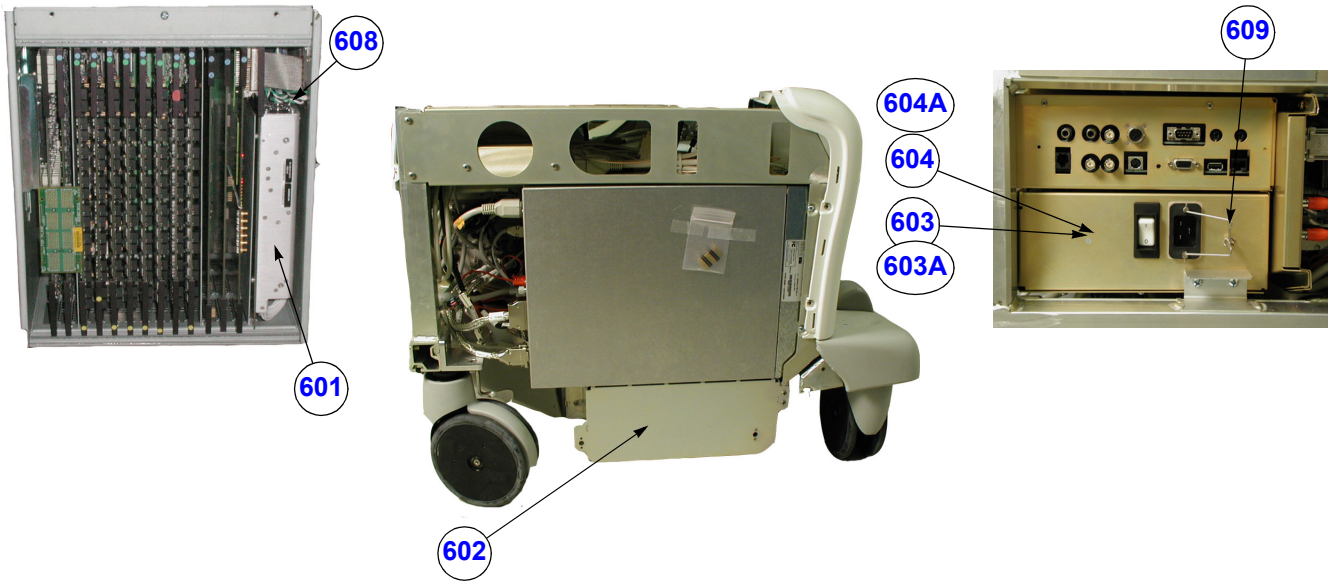


Figure 9-26 Power Distribution

Table 9-26 Power Distribution

Item	Part Name	Part Number	Description	Qty	FRU
601	Card Rack Power Supply PWA Assembly (FEPS)	See Item 409	Power Supplies are mounted on the circuit board	1	1
602	AC Transformer Assembly	FB200581	*- Same as Vivid 7 -*	1	2
603	AC CTRL ASSY, 100-120 V	FC200079	*- Same as Vivid 7 - Obsolete Use 2399515*	1	N
603A	AC CTRL ASSY, 100-120 V	2399515	100-120 VAC Systems	1	1
604	AC CTRL ASSY, 220-240 V	FC200081	*- Same as Vivid 7 - Obsolete Use 2399515-2*	1	N
604A	AC CTRL ASSY, 220-240 V	2399515-2	220-240 VAC Systems	1	1
608	FEP AC Line Filter & Cable	2315960	Attached to side of FEP Card Rack, Includes Line Filter and Power Harness	1	1
609	ACC CLAMP	068E4000	AC Controller Clamp With 2X Screws *- Same As Vivid 7-*	1	1

Section 9-18
Air Distribution

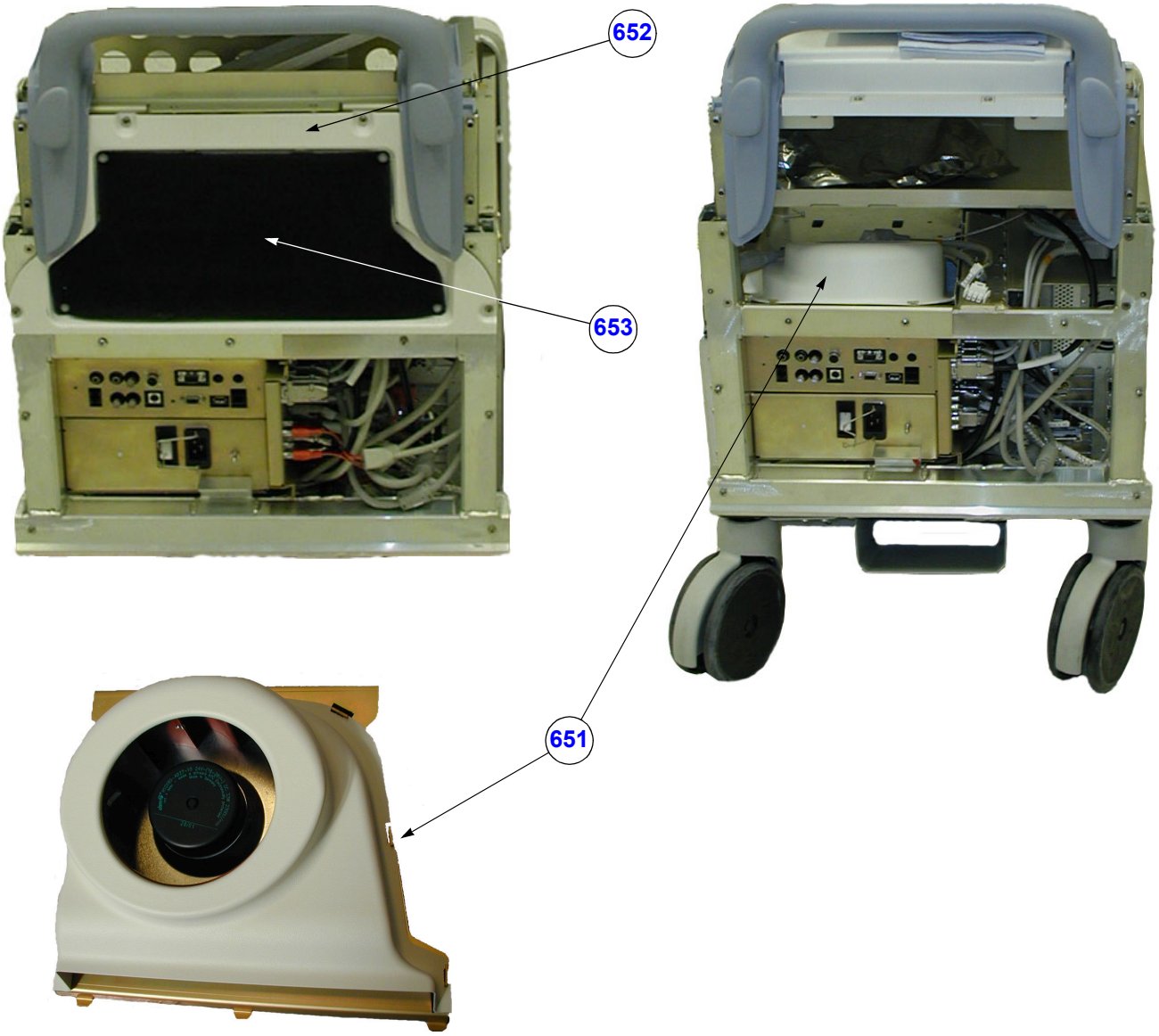


Figure 9-27 Air Distribution Parts

Table 9-27 Air Distribution Parts

Item	Part Name	Part Number	Description	Qty	FRU
651	Fan Assembly	FB200580	*- Same as Vivid 7 -*	1	1
652	Air Intake Cover	FB307379	*- Same as Vivid 7 -*	1	1
653	Filter	FB307903	*- Same as Vivid 7 -*	1	1

Section 9-19
Voice Scan

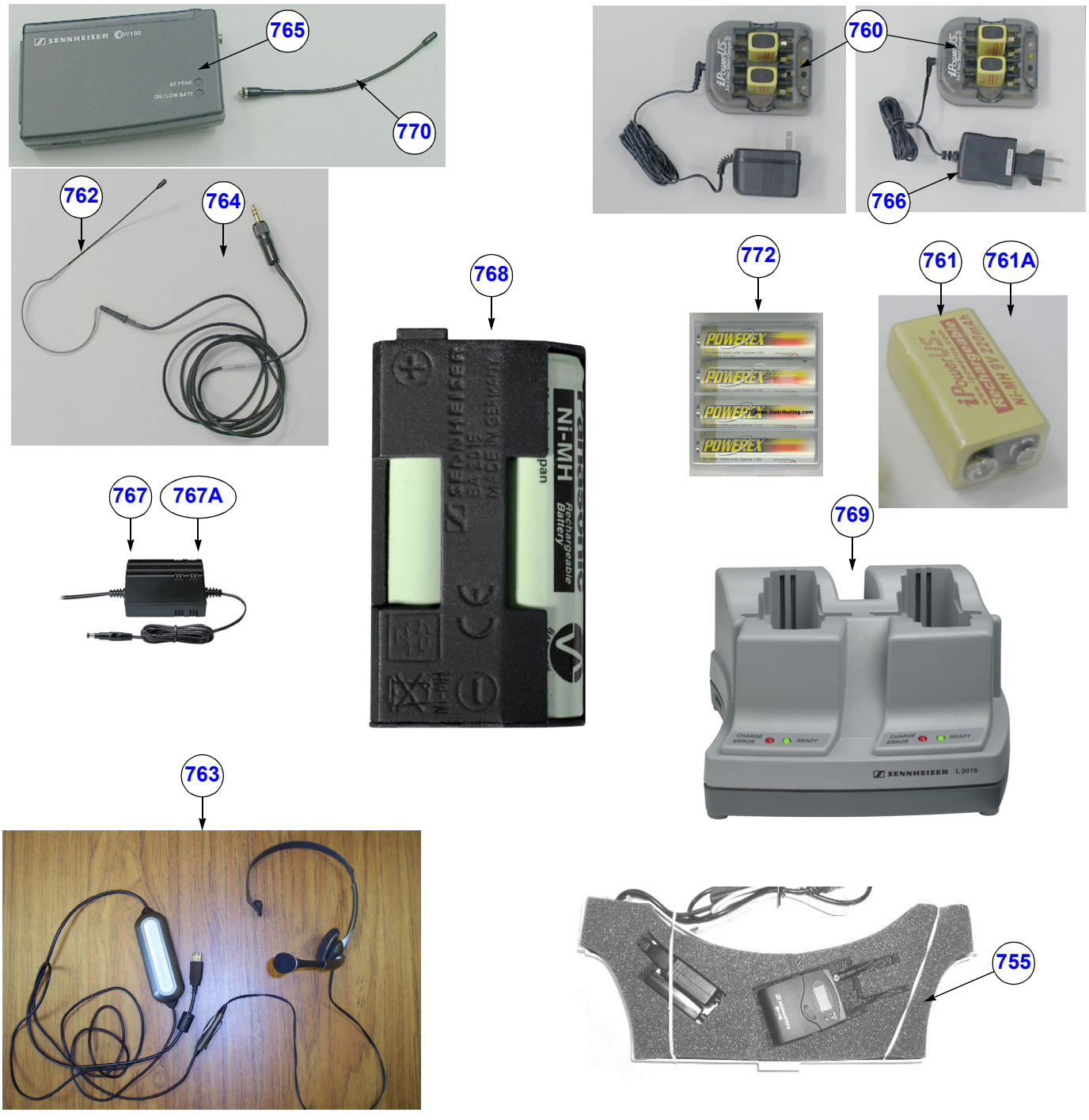


Figure 9-28 Voice Scan Replacement Parts

Table 9-28 Voice Scan

Item	Part Name	Part Number	Description	Qty	FRU
750	Wireless Receiver	2383770	Obsolete - use 5115162 Must also order 5115164	1	N
750A	Wireless Receiver	5115162	wireless receiver generation 2	1	1
755	Tray for Wireless Receiver	2377599		1	2
756	Foam - Wireless Receiver Bottom	2377600		1	2
757	Foam - Wireless Receiver Top	2377601		1	2
760	Battery Charger	2383775		1	1
761	Battery - 9V NiMH	2383776	Yellow 9V Rechargeable Battery Obsolete use 5121291	1	N
761A	Battery - 9V NiMH	5121291	Green 9V Rechargeable Battery	1	1
762	Microphone	2383779	Over the ear style.	1	1
763	USB Headset	2386172		1	1
764	Wireless Microphone Care Kit	2386142	wind screens, clip, and cable only	1	1
765	Beltpack Transmitter - Wireless	2383773	Obsolete - use 5116453 Must also order 5115236	1	N
765A	Beltpack Transmitter - Wireless	5116453	wireless transmitter generation 2 (with charging contacts)	1	1
766	Adapter Kit - 240Vac	2390117	For 2383775 only For 120V order 2383775	1	1
767	AC power adapter, US	5116448	For 5116446 only	1	1
767A	AC power adapter, foreign	5116450	For 5116446 only	1	1
768	Rechargeable Battery Pack for Transmitter	5116454		1	1
769	Battery recharger station	5116446		1	1
770	Antenna	5115891	For 2383770 and 2383773 only	1	1
772	Rechargeable AA Batteries	5115236	rechargeable AA batteries (pack of 4) for generation 2 transmitter	1	1

9-19-1 Voice Scan Cabling

WIRELESS MIC OPTION

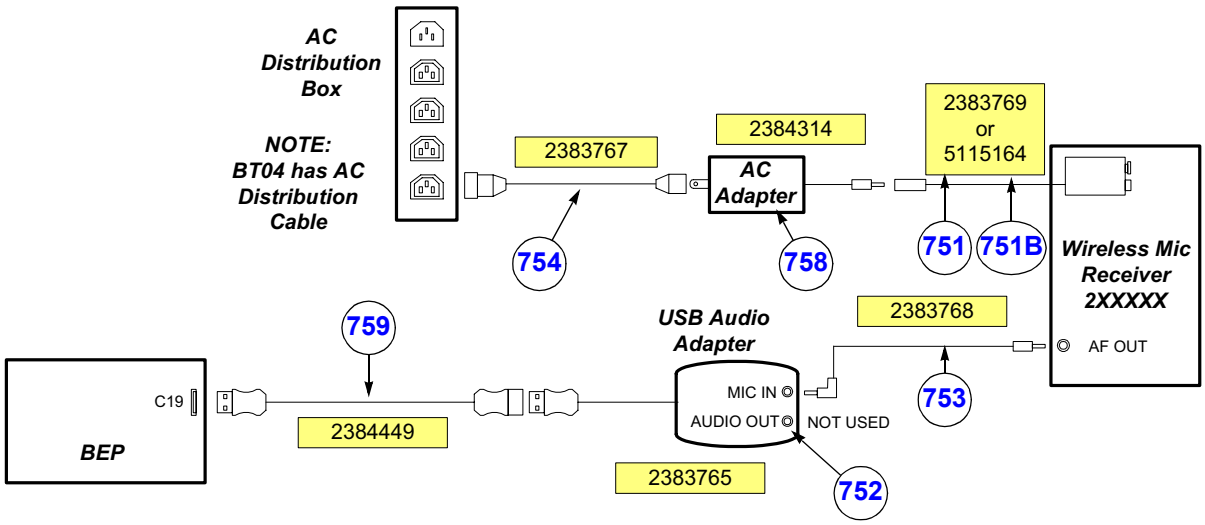


Figure 9-29 Wireless Interconnect

Table 9-29 Wireless Interconnect

Item	Part Name	Part Number	Description	Qty	FRU
751	Battery Eliminator Cable	2383769	For use with 2383770	1	1
751B	Dummy AA Battery Power Supply	5115164	dummy AA battery power supply for wireless receiver generation 2	1	1
752	Audio to USB Adapter	2383765		1	1
753	Audio Cable from Receiver	2383768		1	1
754	Power Cable for Receiver	2383767		1	1
758	AC Adapter - 9V, 1.1A	2384314		1	1
759	USB Extension Cable	2384449		1	1

Section 9-20
4D Components

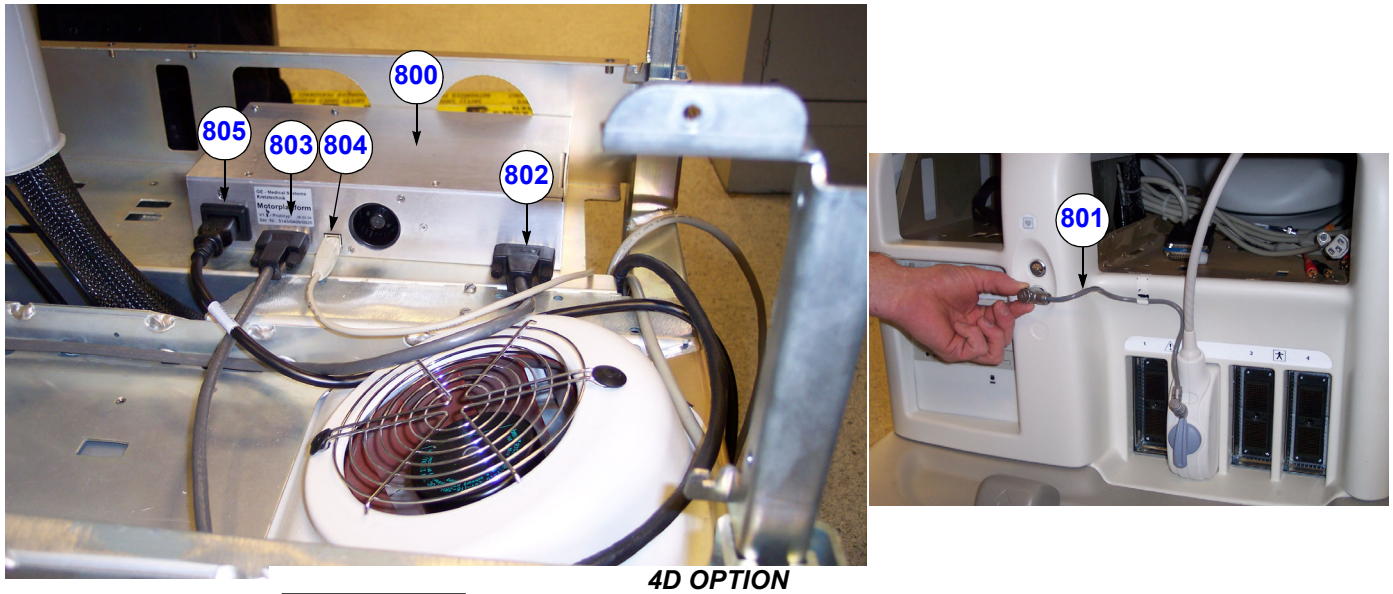


Figure 9-30 4D Components

Table 9-30 4 D Parts

Item	Part Name	Part Number	Description	Qty	FRU
800	4D Motor Controller	2372904		1	1
801	Cable, Bracket to Probe	2384183		1	1
802	Cable, Motor Controller/Bracket assembly	2375551		1	1
803	Cable, Motor Controller to IIO	2375552		1	1
804	Cable, USB to Motor Controller.	2353228		1	1
805	Cable, Motor Controller Power	2375553		1	1

Section 9-21
Continuous Wave (CW) Doppler Components

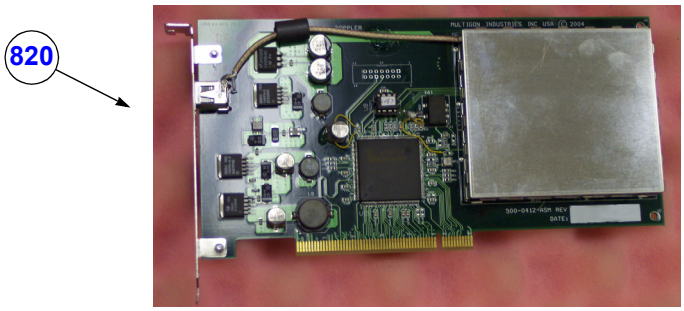


Figure 9-31 Continuous Wave (CW) Doppler Components

Table 9-31 Continuous Wave Doppler Components

Item	Part Name	Part Number	Description	Qty	FRU
820	CW Card	2380188		1	1
821	CW Cable	2380188-13		1	1
822	Mu Metal Shield	2380188-11	inserts under BEP for noise reduction	1	1

Section 9-22
Peripherals

Table 9-32 Approved Peripherals

Item	Part Name	Part Number	Description	Qty	FRU
700	Sony VCR 9500 M2D	2117635 (T3306ER)	H4700TC	1	2
700	Sony VCR 9500 MDP2		H45001PA PAL Version (Europe)	1	2
700A	Sony VCR 9500	E10031AC	PAL Version (Europe)		
701	Sony 2900 Color Video Printer	2207254 (T3306PT)	H4700TD	1	2
701A	Sony 2900 Color Video Printer	ECat	European Replacement		
702	Sony Color Printer UP51MD	2281966	H4700TH	1	2
702A	Sony Color Printer UP51MD	ECat	European Replacement		
703	Sony B/W Video Printer UP895MD	2288502	E8210B	1	2
704	Inkjet Page printer	2301163	H4700PL	1	2
704A	Inkjet Page printer	ECat	European Replacement		
705	3 Position Footswitch	FB200723	HK45011AK - *Same as Vivid 7* -	1	2
706	Sony UP-D895MD	2358588	Digital B/W Printer	1	2
707	Sony UP-D50MD	2358596	Digital Color Printer (will cross up to 5116559 when obsolete)	1	1
708	Sony UP-D21MD	2358449	Digital Color Printer (small footprint)	1	
709	Sony UP-21MD	2351318	Analog Color Printer (small footprint)	1	
710	Sony UP-23MD	2401985			
711	Sony UP-21 & D21 & UP-D23MD Adapter kit	2351082	Mounting plate, cover tray and screws	1	
712	Xerox 8200DP Network Printer	E8203JB			
713	Xerox 8400DP Network Printer				
714	HP6122	2378741			
715	UP-D55MD Sony Printer	5116559			
716	HP-6540	5121837		1	
717	HP-5650	5121839		1	
718	UP-D55 Adapter Kit	5123707	Includes: FC307635 plastic cover/tray 46-312358P36 M4 screws 068X0200 long strap		

Section 9-23
Customer Documentation

Table 9-33 User Documentation

Description	BT02 Part Number	BT03 Part Number	BT04 Part Number	FRU
Basic User Manual (BUM)	2309819-100	2384455-100	5113776-100	N
ARM	2309835-100	2384454-100	5113777-100	N
QG	2309820-100	2384458-100	5113779-100	N
RN	2320595-100	2384452-100	5113780-100	N
eDocs		2384456-200	5113783-200	N
Kit		2392066	5113787-1	N
QC1	2309821-100	2384457-100	5113784-100	N
QC2			5113785-100	N
QC3			5113786-100	N
AIUM	2163920-100	2163920-100	2163920-100	N
Install	22361715-100	22361715-100	22361715-100	N
UG		2388578-100	5113778-100	N
Add		2389047-100	5113781-100	N
OLH		2384453-100	5113782-300	N
Service	2294853-100	2294853-100	2294853-100	N
Install Cklist		2399069-100	2399069-100	N

Section 9-24
Probes



Figure 9-32 LOGIQ™ 9 Probes

Table 9-34 Available Probes

Item	Part Name	Part Number	Description	Qty	FRU
901	3.5C	2296158			1
902	M7C	2294514			1
903	E8C	2294641			1
904	7L	2294521			1
905	10L	2294523			1
906	M12L	2294511			1
907	i12L	2264883			1
908	4S	2295658			1
909	10S	2298589			1
910	8C	2348094			1
911	TCD 3S	2323337			1
912	3.5CS	2051858			1
913	Probe Latching Mechanism (not shown)	2130769	Large round blue locking knob used on some probes		1
914	4C Probe	2401359	H4904PC		1
915	4D3C-L Probe	KTZ195893 (KTI195894)			1
916	4D10L Probe	KTZ156836 (KTI156837)			1
917	4DE7C Probe	KTZ195859 (KTI195860)			1
918	CW 5 MHz Probe	2380188-5	Non-imaging Doppler Probe		1
919	CW 8 MHz Probe	2380188-8	Non-imaging Doppler Probe		1

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Chapter 10
Care & Maintenance

Section 10-1
Overview

10-1-1 Periodic Maintenance Inspections

It has been determined by engineering that your LOGIQ™ 9 system does not have any high wear components that fail with use, therefore no Periodic Maintenance Inspections are mandatory. Some Customers Quality Assurance Programs may require additional tasks and or inspections at a different frequency than listed in this manual.

10-1-2 Purpose of Chapter 10

This chapter describes **Care & Maintenance** on the scanner and peripherals. These procedures are intended to **maintain the quality** of the ultrasound **systems performance**. Read this chapter completely and familiarize yourself with the procedures before performing a task.

Table 10-1 Contents in Chapter 10

Section	Description	Page Number
10-1	Overview	10-1
10-2	Why do Maintenance	10-2
10-3	Maintenance Task Schedule	10-2
10-4	Tools Required	10-4
10-5	System Maintenance	10-5
10-6	Using a Phantom	10-10
10-7	Electrical Safety Tests	10-11
10-8	When There's Too Much Leakage Current...	10-22
	Ultrasound INSPECTION Certificate	10-23

CAUTION **Practice good ESD prevention. Wear an anti–static strap when handling electronic parts and even when disconnecting/connecting cables.**

DANGER **THERE ARE SEVERAL PLACES ON THE BACKPLANE, THE AC DISTRIBUTION, AND DC DISTRIBUTION THAT ARE DANGEROUS. BE SURE TO DISCONNECT THE SYSTEM POWER PLUG AND OPEN THE MAIN CIRCUIT BREAKER BEFORE YOU REMOVE ANY PARTS. BE CAUTIOUS WHENEVER POWER IS STILL ON AND COVERS ARE REMOVED.**

CAUTION **Do not pull out or insert circuit boards while power is ON.**

CAUTION **Do not operate this unit unless all board covers and frame panels are securely in place. System performance and cooling require this.**

Section 10-2
Why do Maintenance

10-2-1 Keeping Records

It is good business practice that ultrasound facilities maintain records of quality checks and corrective maintenance. The Ultrasound Inspection Certificate (provided on page 10-23) provides the customer with documentation that the ultrasound scanner is maintained on a periodic basis.

A copy of the Ultrasound Periodic Maintenance Inspection Certificate should be kept in the same room or near the scanner.

10-2-2 Quality Assurance

In order to gain accreditation from organizations such as the American College of Radiology (USA), it is the customer's responsibility to have a quality assurance program in place for each scanner. The program must be directed by a medical physicists, the supervising radiologist/physician or appropriate designee.

Routine quality control testing must occur regularly. The same tests are performed during each period so that changes can be monitored over time and effective corrective action can be taken.

Testing results, corrective action and the effects of corrective action must be documented and maintained on the site.

Your GE service representative can help you with establishing, performing and maintaining records for a quality assurance program. Please contact us for coverage information and/or price for service.

Section 10-3
Maintenance Task Schedule

10-3-1 How often should care & maintenance tasks be performed?

The Care & Maintenance Task Schedule (provided on page 10-3) specifies how often your LOGIQ™ 9 should be serviced and outlines items requiring special attention.

NOTE: It is the customer's responsibility to ensure the LOGIQ™ 9 care & maintenance is performed as scheduled in order to retain its high level of safety, dependability and performance.

Your GE Service Representative has an in-depth knowledge of your LOGIQ™ 9 ultrasound scanning system and can best provide competent, efficient service. Please contact us for coverage information and/or price for service.

The service procedures and recommended intervals shown in the Care & Maintenance Task Schedule assumes that you use your LOGIQ™ 9 for an average patient load (10-12 per day) and not use it as a primary mobile unit which is transported between diagnostic facilities.

NOTE: If conditions exist which exceed typical usage and patient load, then it is recommended to increase the maintenance frequencies.

Table 10-2 Customer Care Schedule

Service at Indicated Time	Daily	Weekly	Monthly	Per Facilities QA Program	Notes
Clean Probes	•*				* or before each use
Clean Probe Holders	•				
Clean Air Filter		•			more frequently depending on your environment
Inspect AC Mains Cable			•		Mobile Unit Check Weekly
Inspect Cables and Connectors			•		
Clean Console			•		
Clean Monitor and Touch Panel			•		
Inspect Wheels, Casters, brakes and Swivel Locks			•		Mobile Unit Check Daily
Check Control Panel Movement			•		Mobile Unit Check Daily
Console Leakage Current Checks				•	also after corrective maintenance
Peripheral Leakage Current Checks				•	also after corrective maintenance
Surface Probe Leakage Current Checks				•	also after corrective maintenance
Endocavity Probe Leakage Current Checks				•	also after corrective maintenance
Transesphongeal Probe Leakage Current Checks				•	also after corrective maintenance
Surgical Probe Leakage Current Checks				•	also after corrective maintenance
Measurement Accuracy Checks				•	also after corrective maintenance
Probe/Phantom Checks				•	also after corrective maintenance
Functional Checks				•	also after corrective maintenance

Section 10-4
Tools Required

10-4-1 Special Tools, Supplies and Equipment

10-4-1-1 Specific Requirements for Care & Maintenance

Table 10-3 Overview of Requirements for Care & Maintenance

Tool	Part Number	Comments
Digital Volt Meter (DVM)		
Anti Static Kit	46–194427P231 46–194427P279 46–194427P369 46–194427P373 46–194427P370	Kit includes anti–static mat, wrist strap and cables for 200 to 240 V system 3M #2204 Large adjustable wrist strap 3M #2214 Small adjustable wrist strap 3M #3051 conductive ground cord
Anti Static Vacuum Cleaner	46–194427P278 46–194427P279	120V 230V
Air Filter	Section 9-18	air intake
Safety Analyzer	46–285652G1	DALE 600 KIT (or equivalent) for electrical tests
SVHS VCR Cassette	E7010GG E7010GF	60 minute 120 minute
SVHS VCR Head Cleaner		See VCR user manual for requirements
3.5” MOD MEDIA	E8381AA E8381AB	blank 128 M disk blank 230 M disk
5.25” MOD Media		
3.5” MOD Media Cleaner	2117811	cleans the diskettes
5.25” MOD Media Cleaner		cleans the diskettes
3.5” MOD Head Cleaner Kit	2148392	cleans the drive heads
5.25” MOD Head Cleaner Kit		cleans the drive heads
QIQ Phantom	E8370RB	RMI Grayscale Target Model 403GS
CD-RW Media		For LOGIQ™ 9
B/W Printer Cleaning Sheet		See printer user manual for requirements
Color Printer Cleaning Sheet		See printer user manual for requirements
Disposable Gloves		

Section 10-5
System Maintenance

10-5-1 Preliminary Checks

The preliminary checks take about 15 minutes to perform. Refer to the system user documentation whenever necessary.

Table 10-4 System Checks

Step	Item	Description
1	Ask & Listen	Ask the customer if they have any problems or questions about the equipment.
2	Paperwork	Fill in the top of the Ultrasound Inspection Certificate (see page 23). Note all probes and system options.
3	Power up	Turn the system power on and verify that all fans and peripherals turn on. Watch the displays during power up to verify that no warning or error messages are displayed.
4	Probes	Verify that the system properly recognizes all probes.
5	Displays	Verify proper display on the monitor and touch panel.
6	Presets	Backup all customer presets on an CD-RW.

10-5-2 Functional Checks (See Also Chapter 4)

The functional checks take about 60 minutes to perform. Refer to the system user documentation whenever necessary.

10-5-2-1 System Checks

Table 10-5 System Functional Checks

Check	Step	Description
	B-Mode	Verify basic B-Mode (2D) operation. Check the basic system controls that affect this mode of operation.
	CF-Mode	Verify basic CF-Mode (Color Flow Mode) operation. Check the basic system controls that affect this mode of operation.
	Doppler Modes	Verify basic Doppler operation (PW and CW if available). Check the basic system controls that affect this mode of operation.
	M-Mode	Verify basic M-Mode operation. Check the basic system controls that affect this mode of operation.
	*Applicable Software Options	Verify the basic operation of all optional modes such as Multi-Image, 3D, Contrast, Harmonics, Cine, Stress Echo,... etc. Check the basic system controls that affect each options operation.
	Xmit/Recv Elements	Use the Visual Channel Utility on the 10L probe to verify that all system xmit/recv channels are functional.
	Keyboard Test	Perform the Keyboard Test Procedure to verify that all keyboard controls are OK.
	Monitor	Verify basic Monitor display functions. Refer to Chapter 3 of the User Manual.
	Touch Panel	Verify basic Touch Panel display functions. Refer to Chapter 3 of the User Manual.
	Measurements	Scan a gray scale phantom and use the measurement controls to verify distance and area calculation accuracy. Refer to the User Manual, Chapter 18, for measurement accuracy specifications.

*NOTE: * Some software may be considered standard depending upon system model configuration.*

10-5-2-2 Peripheral/Option Checks

If any peripherals or options are not part of the system configuration, the check can be omitted. Refer to the User Manual for a list of approved peripherals/options.

Table 10-6 GE Approved Peripheral/Hardware Option Functional Checks

Step	Item	Description
1	VCR	Verify record/playback capabilities of the VCR. Clean heads and covers if necessary.
2	B/W Printer	Verify hardcopy output of the B/W video page printer. Clean heads and covers if necessary.
3	Color Printer	Verify hardcopy output of the Color video page printer. Clean heads and covers if necessary.
4	DICOM	Verify that DICOM is functioning properly. Send an image to a DICOM device.
5	InSite/iLinq	Verify that InSite is functioning properly. Ensure two-way remote communications. (Warranty & Contract Customers only)
6	Camera	Verify hardcopy output of the film camera. Clean as necessary.
7	Footswitch	Verify that the footswitch is functioning as programed. Clean as necessary.
8	ECG	Verify basic operation with customer

10-5-3 Input Power

10-5-3-1 Mains Cable Inspection

Table 10-7 Mains Cable Inspection

Step	Item	Description
1	Unplug Cord	Disconnect the mains cable from the wall and system.
2	Inspect	Inspect it and its connectors for damage of any kind.
3	Verify	Verify that the LINE, NEUTRAL and GROUND wires are properly attached to the terminals, and that no strands may cause a short circuit.
4	Verify	Inlet connector retainer is functional.

10-5-4 Cleaning

10-5-4-1 General Cleaning

Table 10-8 General Cleaning

Step	Item	Description
1	Console	Use a fluid detergent in warm water on a soft, damp cloth to carefully wipe the entire system. Be careful not to get the cloth too wet so that moisture does not enter the console.
2	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).

10-5-4-2 Air Filter Cleaning

Table 10-9 Air Filter Cleaning - frequency varies with your environment

Step	Item	Description
1	Remove Filter Cover	Refer to Chapter 8 for air filter location and removal instructions.
2	Clean Filter	The filters can be cleaned in sprinkling water, or they can be dusted with a vacuum cleaner. If the filter is metal wash and/or vacuum. If the filter is fiber or plastic vacuum or replace.
3	Install Filter	Install the clean filter.

NOTE: For your convenience or of the air filter is too dirty, replacement filters are available. Refer to Chapter 9 for the air filter replacement part number.

10-5-5 Physical Inspection

Table 10-10 Physical Checks

Step	Item	Description
1	Labeling	Verify that all system labeling is present and in readable condition. Refer to the LOGIQ™ 9 User Manual for details.
2	Scratches & Dents	Inspect the console for dents, scratches or cracks.
3	Control Panel	Inspect keyboard and control panel. Note any damaged or missing items.
4	Control Panel Movement	Verify ease of control panel (Operator I/O Panel) movement in all acceptable directions. Ensure that it latches in position as required.
5	Wheels & Brakes	Check all wheels and casters for wear and verify operation of foot brake, to stop the unit from moving, and release mechanism. Check all caster locks and caster swivel locks for proper operation.
6	Cables & Connectors	Check all internal cable harnesses and connectors for wear and secure connector seating. Pay special attention to footswitch assembly and probe strain or bend reliefs.
7	Shielding & Covers	Check to ensure that all EMI shielding, internal covers, air flow panels and screws are in place. Missing covers and hardware could cause EMI/RFI problems while scanning.
8	External I/O	Check all connectors for damage and verify that the labeling is good.
9	Op Panel Lights	Check for proper operation of all operator panel and TGC lights.
10	Monitor Light	Check for proper operation of any monitor lights if available.
11	External Microphone	Check for proper operation of any external microphones by recording an audio test.

10-5-6 Optional Diagnostic Checks

Optionally you can access the diagnostic software as described in Chapters 5 or 7. View the error logs and run desired diagnostics.

10-5-6-1 View the Logs

1.) Review the system error log for any problems.

2.) Check the temperature log to see if there are any trends that could cause problems in the future.

10-5-7 Probe Maintenance

10-5-7-1 Probe Related Checks

Table 10-11 Probe Related Checks

Step	Item	Description
1	Probe Holder	Clean probe holders (they may need to be soaked to remove excess gel).
2	Probes	Thoroughly check the system probe connectors and remove dust from inside the connector sockets if necessary. Visually check for bent, damaged or missing pins

10-5-7-2 Basic Probe Care

The system user manuals and various probe handling cards provide a complete description of probe care, maintenance, cleaning and disinfection. Ensure that you are completely familiar with the proper care of GE probes.

Ultrasound probes can be easily damaged by improper handling. See the User Manual and probe care cards for more details. Failure to follow these precautions can result in serious injury and equipment damage. Failure to properly handle or maintain a probe may also void its warranty.

Any evidence of wear indicates the probe cannot be used.

Do a visual check of the probe pins and system sockets before plugging in a probe.

TEE and Interoperative probes often have special considerations and individual probe user manuals. For TEE and Interoperative probes also refer to their separate user manuals.

10-5-7-3 Basic Probe Cleaning

Refer to the User's Manual for details on probe cleaning.

NOTE: To help protect yourself from blood borne diseases, wear approved disposable gloves. These are made of nitrile derived from vegetable starch to prevent allergic latex reactions.

NOTE: Failure to follow the prescribed cleaning or disinfection procedures will void the probe's warranty. DO NOT soak or wipe the lens with any product not listed in the User Manual. Doing so could result in irreparable damage to the probe. Follow care instructions that came with the probe.

NOTE: Disinfect a defective probe before you return it. Be sure to tag the probe as being disinfected.

Section 10-6 Using a Phantom

See the Basic User Manual "*Customer Maintenance*" for information on using a phantom and quality assurance tests.

Section 10-7
Electrical Safety Tests

10-7-1 Safety Test Overview

The electrical safety tests in this section are based on and conform to NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. They are intended for the electrical safety evaluation of cord-connected, electrically operated, patient care equipment. If additional information is needed, refer to the NFPA 99 (For USA) and IEC 60601-1 documents.

WARNING ***THE USER MUST ENSURE THAT THE SAFETY INSPECTIONS ARE PERFORMED AT LEAST EVERY 12 MONTHS ACCORDING TO THE REQUIREMENTS OF THE PATIENT SAFETY STANDARD IEC-EN 60601-1. ONLY TRAINED PERSONS ARE ALLOWED TO PERFORM THE SAFETY INSPECTIONS MENTIONED ABOVE.***

CAUTION **To avoid electrical shock, the unit under test must not be connected to other electrical equipment. Remove all interconnecting cables and wires. The unit under test must not be contacted by users or patients while performing these tests.**

CAUTION **Possible risk of infection. Do not handle soiled or contaminated probes and other components that have been in patient contact. Follow appropriate cleaning and disinfecting procedures before handling the equipment.**

Test the system, peripherals and probes for leakage current. Excessive leakage current can cause injury or death in sensitive patients. High leakage current can also indicate degradation of insulation and a potential for electrical failure. Do not use probes or equipment having excessive leakage current.

To minimize the risk that a probe may shock someone the customer should:

- Not use a probe that is cracked or damaged in any way
- Check probe leakage current:
    * Based on your facilities QA program for surface probes
    * Based on your facilities QA program for endocavitary probes
    * whenever probe damage is suspected

10-7-2 GEMS Leakage Current Limits

The following limits are summarized for NFPA 99 (For USA) and IEC 60601-1 Medical Equipment Safety Standards. These limits are GEMS standards and in some cases are lower than the above standards listed.

Table 10-12 Chassis Leakage Current Limits—Accessible Metal Surfaces

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral
USA	N/A	0.3 mA	0.3 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA

Table 10-13 Type BF Applied Part Leakage Current Limits - Non-Conductive (Floating) Surface and Cavity Probes

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
USA	0.05 mA	0.05 mA	0.05 mA	0.05 mA	N/A
Other	0.1 mA	0.5 mA	0.5 mA	0.5 mA	5.0 mA

Table 10-14 Type CF Applied Part Leakage Current Limits - Surgical Probes and ECG Connections

Country	Normal Condition	Open Ground	Reverse Polarity	Open Neutral	*Mains Applied
USA	0.01 mA	0.05mA	0.05 mA	N/A	0.025 mA
Other	0.01 mA	0.05 mA	0.05 mA	0.05 mA	0.05 mA

*NOTE: *Mains Applied refers to the sink leakage test where mains (supply) voltage is applied to the part to determine the amount of current that will pass (or sink) to ground if a patient contacted mains voltage.*

The following tests are performed at the factory and should be performed at the site. These tests are: grounding continuity, chassis leakage current, probe leakage current, and ECG leakage current. All measurements are made with an electrical safety analyzer.

10-7-3 Outlet Test - Wiring Arrangement - USA & Canada

Test all outlets in the area for proper grounding and wiring arrangement by plugging in the neon outlet tester and noting the combination of lights that are illuminated. Any problems found should be reported to the hospital immediately and the receptacle should not be used.

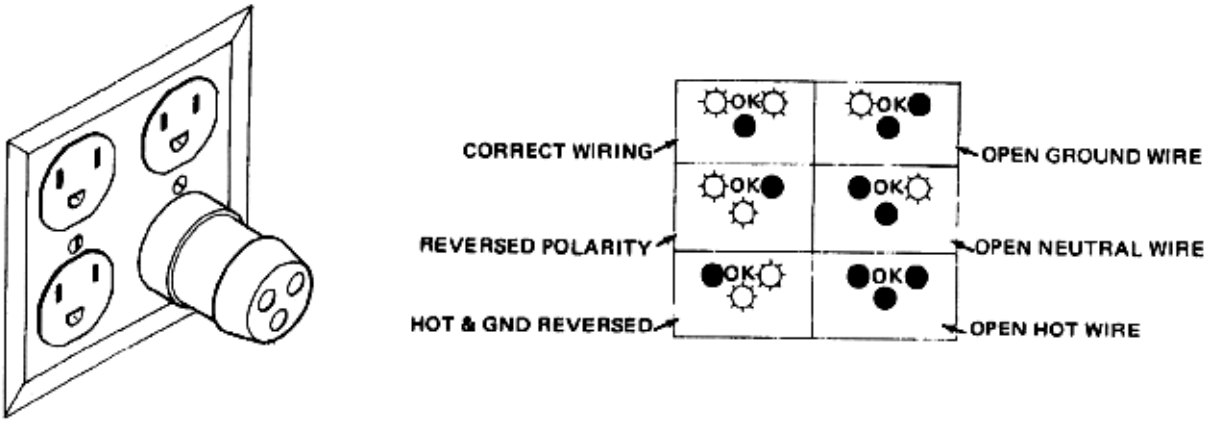


Figure 10-1 Typical Outlet Tester

NOTE: No outlet tester can detect the condition where the Neutral (grounded supply) conductor and the Grounding (protective earth) conductor are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

10-7-4 Grounding Continuity

CAUTION **Electric Shock Hazard. The patient must not be contacted to the equipment during this test**

Measure the resistance from the third pin of the attachment plug to the exposed metal parts of the case. The ground wire resistance should be less than **0.2** ohms. Reference the procedure in the IEC 601-1.1.

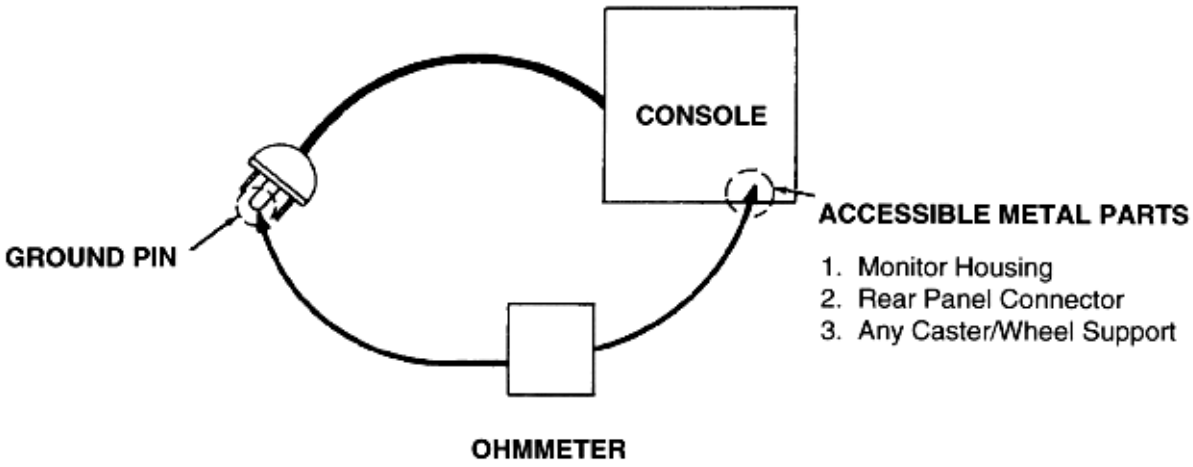


Figure 10-2 Ground Continuity Test

10-7-4-1 Meter Procedure

Follow these steps to test the ground wire resistance.

1.) Turn the LOGIQ™ 9 unit OFF.
2.) Plug the unit into the meter, and the meter into the tested AC wall outlet.
3.) Plug the black chassis cable into the meter's “CHASSIS” connector and attach the black chassis cable clamp to an exposed metal part of the LOGIQ™ 9 unit.
4.) Set the meter's “FUNCTION” switch to the RESISTANCE position.
5.) Set the meter's “POLARITY” switch to the OFF (center) position.
6.) Measure and record the ground wire resistance.

10-7-5 Chassis Leakage Current Test

10-7-5-1 Definition

This test measures the current that would flow in a grounded person who touched accessible metal parts of the bedside station if the ground wire should break. The test verifies the isolation of the power line from the chassis. The meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit On and Off, with the power line polarity Normal and Reversed. Record the highest reading.

CAUTION **Electric Shock Hazard. When the meter's ground switch is OPEN, don't touch the unit!**

CAUTION **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged.**

10-7-5-2 Generic Procedure

The test verifies the isolation of the power line from the chassis. The testing meter is connected from accessible metal parts of the case to ground. Measurements should be made with the unit ON and OFF, with the power line polarity Normal and Reversed. Record the highest reading of current.

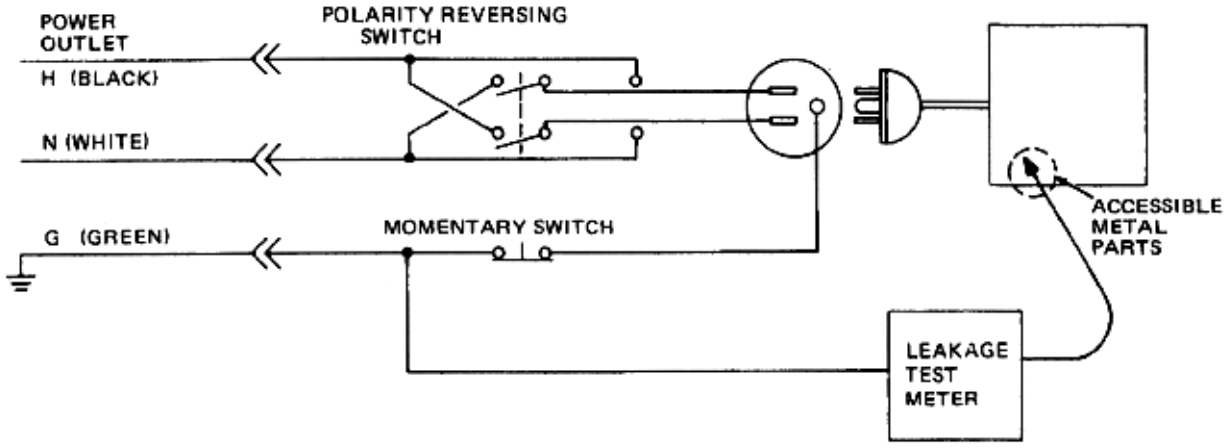


Figure 10-3 Set Up for Chassis Source Leakage Current, IEC 601-1 Clause 19 - Continuos Leakage Currents and Patient, Auxiliary Currents

When using the Microguard or a similar test instrument, its power plug may be inserted into the wall outlet and the equipment under test is plugged into the receptacle on the panel of the meter. This places the meter in the grounding conductor and the current flowing from the case to ground will be indicated in any of the current ranges. The maximum allowable limit for chassis source leakage is shown in Table 10-12.

7.) Follow the test conditions described for respective test points shown in Table 10-15.

Table 10-15 Chassis Leakage Current Test Condition

TEST	CONDITION
1	Mounting screw for probe receptacle
2	caster support
3	Mounting screw for CRT housing
4	Mounting screw for peripheral plugged into unit
5	Mounting screw for other peripheral powered by unit

8.) Keep a record of the results with other hard copies of PM data kept on site.

10-7-5-3 Data Sheet for Chassis Source Leakage Current

The test passes when all readings measure less than the value shown in Table 10-12. Record all data on the PM Inspection Certificate.

Table 10-16 Typical Data Sheet for Chassis Source Leakage Current

Unit Power	Tester Polarity Switch	Tester Neutral or Ground Switch	Test 1 Probe Connector	Test 2 caster	Test 3 CRT	Optional Test 4	Optional Test 5
Enter Name of tested peripheral here:							
ON	NORM	OPEN					
ON	NORM	CLOSED					
ON	REV	OPEN					
ON	REV	CLOSED					
OFF	NORM	OPEN					
OFF	NORM	CLOSED					
OFF	REV	OPEN					
OFF	REV	CLOSED					

10-7-6 Isolated Patient Lead (Source) Leakage–Lead to Ground

10-7-6-1 Definition

This test measures the current which would flow to ground from any of the isolated ECG leads. The meter simulates a patient who is connected to the monitoring equipment and is grounded by touching some other grounded surface. Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the ultrasound console Off and On. For each combination the operating controls, such as the lead switch, should be operated to find the worst case condition.

⚠ **CAUTION** **Equipment damage possibility. Never switch the Polarity when the unit is powered ON. Be sure to turn the unit power OFF before switching the polarity using the POLARITY switch. Otherwise, the unit may be damaged.**

10-7-6-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the operating controls such as the lead switch should be operated to find the worst case condition.

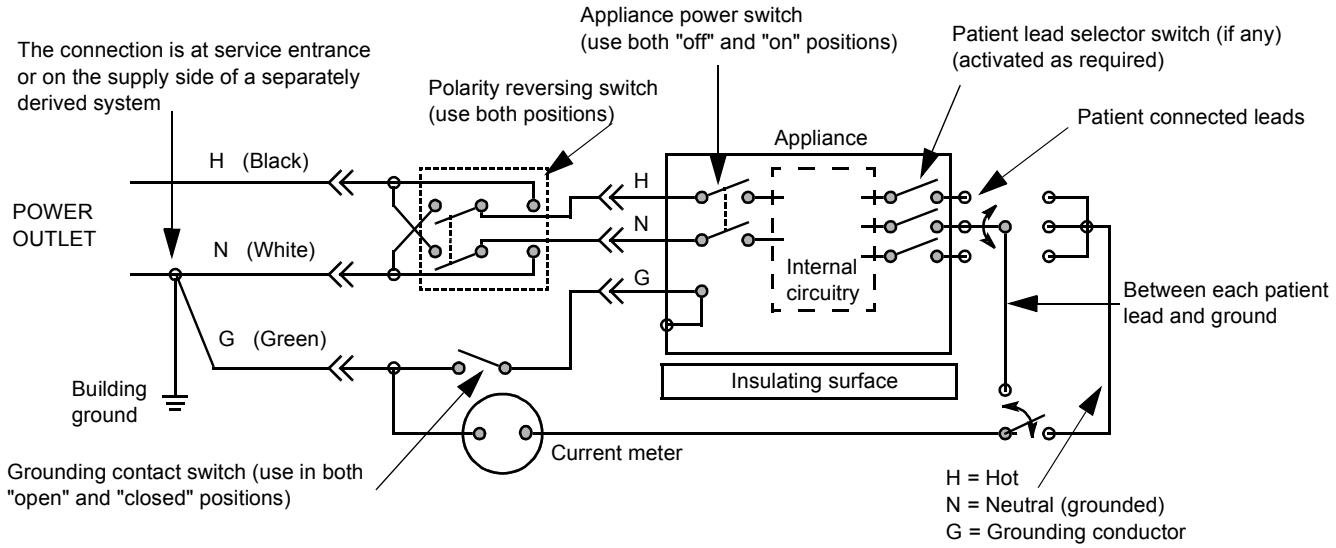

The connection is at service entrance or on the supply side of a separately derived system
Appliance power switch (use both "off" and "on" positions)
Patient lead selector switch (if any) (activated as required)
Polarity reversing switch (use both positions)
Patient connected leads
Appliance
H (Black)
POWER OUTLET
N (White)
H
N
G
Internal circuitry
Between each patient lead and ground
G (Green)
Insulating surface
Building ground
Current meter
Grounding contact switch (use in both "open" and "closed" positions)
H = Hot
N = Neutral (grounded)
G = Grounding conductor

Figure 10-4 Test Circuit for Measuring Non-Isolated Patient Leads

Table 10-17 Testing Power Conditions

ECG Power	Meter's Polarity Switch	Meter's Neutral Switch
ON	NORM	CLOSED
ON	NORM	OPEN
ON	REVERSE	CLOSED
ON	REVERSE	OPEN
OFF	NORM	CLOSED
OFF	NORM	OPEN
OFF	REVERSE	CLOSED
OFF	REVERSE	OPEN

10-7-7 Isolated Patient Lead (Source) Leakage–Lead to Lead

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-LEAD position. Select and test each of the five ECG lead positions (except ALL) on the LEAD selector, testing each to the power condition combinations found in the table. Record the highest leakage current measured.

10-7-8 Isolated Patient Lead (Sink) Leakage-Isolation Test

Reference the procedure in the IEC 60601-1. When using the Dale 600, switch the meter's function selector to the LEAD-ISO. Select the ALL position on the lead selector. Depress the rocker switch to ISO TEST to test lead isolation.

⚠ **CAUTION** **Line voltage is applied to the ECG leads during this test. To avoid possible electric shock hazard, the system being tested must not be touched by patients, users or anyone while the ISO TEST switch is depressed.**

NOTE: It is not necessary to test each lead individually or power condition combinations as required in previous tests.

10-7-8-1 Data Sheet for ECG Leakage Current

The test passes when all readings measure less than the value shown in the table below. Record all data on the PM Inspection Certificate.

Table 10-18 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit	
		GROUND OPEN	GROUND CLOSED
Patient Lead to Ground Leakage Current Test	115V	10uA	10uA
and Patient Lead to Lead Leakage Current Test	220/240V	500uA	10uA

Table 10-19 Maximum Allowance Limit for ECG Leakage Current

	AC Power Source	Maximum Allowance Limit
Patient Lead Isolation Current Test	115V	20uA
	220/240V	5mA

Table 10-20 Typical Data Sheet for ECG Leakage Current

ECG Power	Tester Polarity Switch	Tester Ground Switch	Tester Lead Selector				
			RL	RA	LA	LL	C
ON	NORM	CLOSED					
ON	REVERSE	CLOSED					
ON	NORM	OPEN					
ON	REVERSE	OPEN					
OFF	NORM	CLOSED					
OFF	REVERSE	CLOSED					
OFF	NORM	OPEN					
OFF	REVERSE	OPEN					

10-7-9 Probe Leakage Current Test

10-7-9-1 Definition

This test measures the current that would flow to ground from any of the probes through a patient who is being scanned and becomes grounded by touching some other grounded surface.

10-7-9-2 Generic Procedure

Measurements should be made with the ground open and closed, with power line polarity normal and reversed, and with the unit Off and On. For each combination, the probe must be active to find the worst case condition.

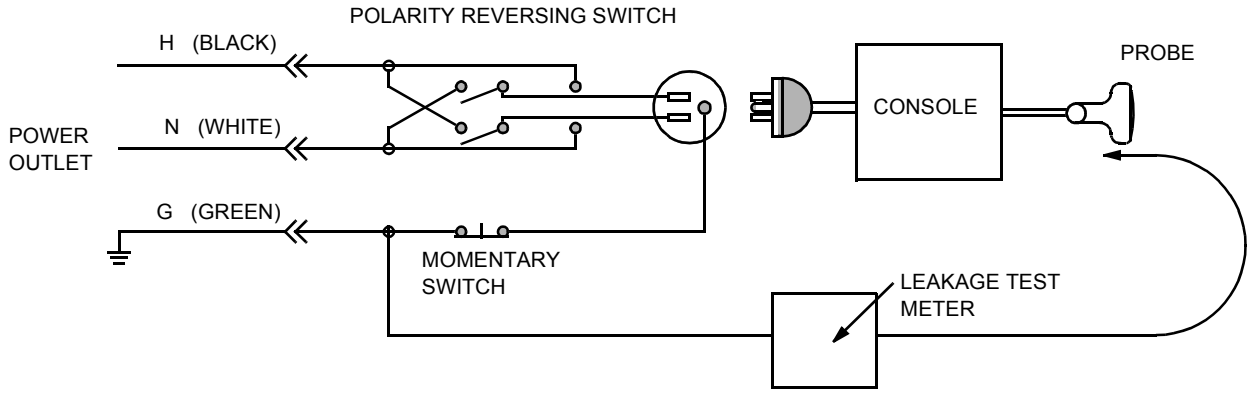


Figure 10-5 Set Up for Probe Leakage Current

NOTE: Each probe will have some amount of leakage current, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement.

10-7-9-3 No Meter Probe Adapter Procedure

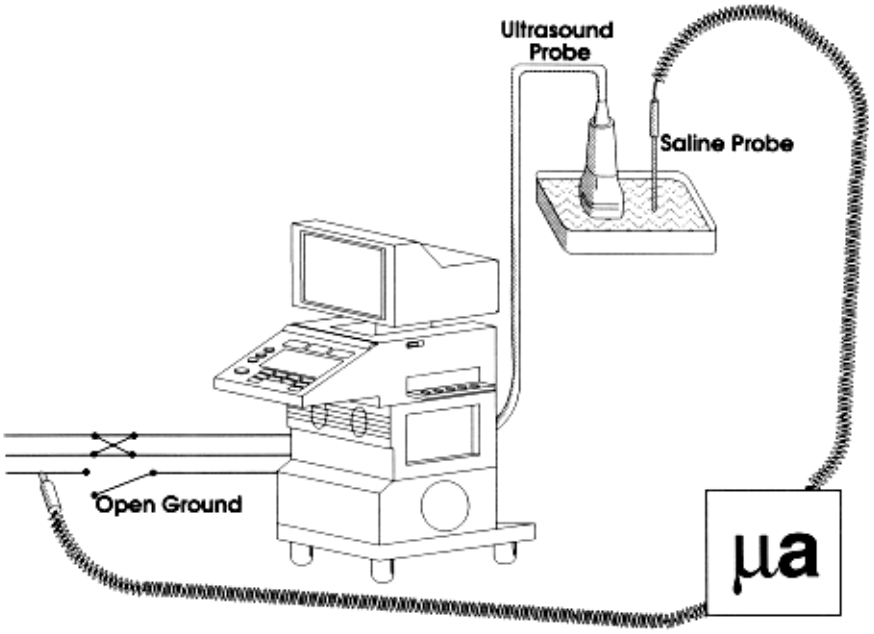


Figure 10-6 Check Without Probe Adapter

Follow these steps to test each transducer for leakage current.

1.) Turn the LOGIQ™ 9 unit OFF.
2.) Plug the unit into the test meter, and the meter into the tested AC wall outlet.
3.) Plug the external probe into the meter's “EXTERNAL” connector.
4.) Set the meter's “FUNCTION” switch to EXTERNAL position.
5.) Connect the probe for test with the connector of the console.
6.) Add the saline probe and the imaging area of the probe into the saline bath.
7.) Have unit power ON for the first part; turn it OFF for the second half.
8.) Depress the ISO TEST rocker switch and record the highest current reading.
9.) Follow the test conditions described in Table 10-21 for every transducer.
10.)Keep a record of the results with other hand copies of PM data.

10-7-9-4 Data Sheet for Transducer Source Leakage Current

The test passes when all readings measure less than the values shown in Table 10-13 and Table 10-14. Record all data on the PM Inspection Certificate.

CAUTION **Equipment damage possibility. Never switch the Polarity and the status of Neutral when the unit is powered ON. Be sure to turn the unit power OFF before switching them using the POLARITY switch and/or the NEUTRAL switch. Otherwise, the unit may be damaged**

Table 10-21 Typical Data Sheet For Transducer Source Leakage Current

Transducer Tested:			
Unit Power	**Tester Power Polarity Switch**	**Tester GROUND or NEUTRAL Switch**	**Measurement**
ON	NORM	OPEN	
ON	NORM	CLOSED	
ON	REV	OPEN	
ON	REV	CLOSED	
OFF	NORM	OPEN	
OFF	NORM	CLOSED	
OFF	REV	OPEN	
OFF	REV	CLOSED	

Section 10-8
When There's Too Much Leakage Current...

CHASSIS FAILS

Check the ground on the power cord and plug for continuity. Ensure the ground is not broken, frayed, or intermittent. Replace any defective part.

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

NOTE: No outlet tester can detect the condition where the white neutral wire and the green grounding wire are reversed. If later tests indicate high leakage currents, this should be suspected as a possible cause and the outlet wiring should be visually inspected.

PROBE FAILS

Test the probe in another connector to isolate if the fault lies with the probe or the scanner.

NOTE: Each probe will have some amount of leakage, dependent on its design. Small variations in probe leakage currents are normal from probe to probe. Other variations will result from differences in line voltage and test lead placement. The maximum allowable leakage current for body surface contact probe differs from inter-cavity probe. Be sure to enter the correct probe type in the appropriate space on the check list.

If excessive leakage current is slot dependent, inspect the system connector for bent pins, poor connections, and ground continuity.

If the problem remains with the probe, replace the probe.

PERIPHERAL FAILS

Tighten all grounds. Ensure star washers are under all ground studs.

Inspect wiring for bad crimps, poor connections, or damage.

STILL FAILS

If all else fails, begin isolation by removing the probes, external peripherals, then the on board ones, one at a time while monitoring the leakage current measurement.

NEW UNIT

If the leakage current measurement tests fail on a new unit and if situation can not be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

ECG FAILS

Inspect cables for damage or poor connections.

ULTRASOUND INSPECTION CERTIFICATE

Customer Name:		System ID:	Dispatch Number / Date Performed:	Warranty/Contract/HBS
System Type		Model Number:	Serial Number:	Manufacture Date:
Probe 1:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 2:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 3:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 4:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 5:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 6:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 7:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 8:	Frequency:	Scan Format*:	Model Number:	Serial Number:
Probe 9:	Frequency:	Scan Format*:	Model Number:	Serial Number:

* Scan Format: Phased Array, Linear Array, Curved Array, Mechanical Array or Other

FUNCTIONAL CHECKS

Functional Check (if applicable)	OK? or N/A
B-Mode Function	
Doppler Modes Function	
CF-Mode Function	
M-Mode Function	
Applicable Software Options	
Applicable Hardware Options	
Control Panel	
Monitor	
Touch Panel	
Measurement Accuracy	
GE Approved Peripherals	

PHYSICAL INSPECTION AND CLEANING

Physical Inspection and Cleaning (if applicable)	Inspect	Clean
Console		
Monitor		
Touch Panel		
Air Filter		
Probe Holders		
External I/O		
Wheels, Brakes & Swivel Locks		
Cables and Connectors		
GE Approved Peripherals (VCR, CD-RW, MOD, Printers)		

COMMENTS:

ELECTRICAL SAFETY

Electrical Test Performed	Max Value Allowed	Value Measured	OK?	Comments
Outlet (correct ground &wiring config.)				
System Ground Continuity				
Chassis Source Leakage Current - Probe				
Chassis Source Leakage Current - Caster				
Chassis Source Leakage Current - CRT				
Patient Lead Source Leakage (Lead to Ground)				
Patient Lead Source Leakage (Lead to Lead)				
Patient Lead Source Leakage (Isolation)				
Peripheral 1 Leakage Current				
Peripheral 1Ground Continuity				
Peripheral 2 Leakage Current				
Peripheral 2Ground Continuity				
Peripheral 3 Leakage Current				
Peripheral 3Ground Continuity				
PROBES				
Probe Number (from previous page)	**Max Value Allowed**	**Max Value Measured**	**OK?**	**Comments**
Probe 1:				
Probe 2:				
Probe 3:				
Probe 4:				
Probe 5:				
Probe 6:				
Probe 7:				
Probe 8:				
Probe 9:				

Final Check. All system covers are in place. System scans with all probes as expected.

Accepted by: _____

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